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Volume 6, Number 3
(July 1979-September 1979)

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Oil Pollution Abstracts

Vol. 6, No. 3
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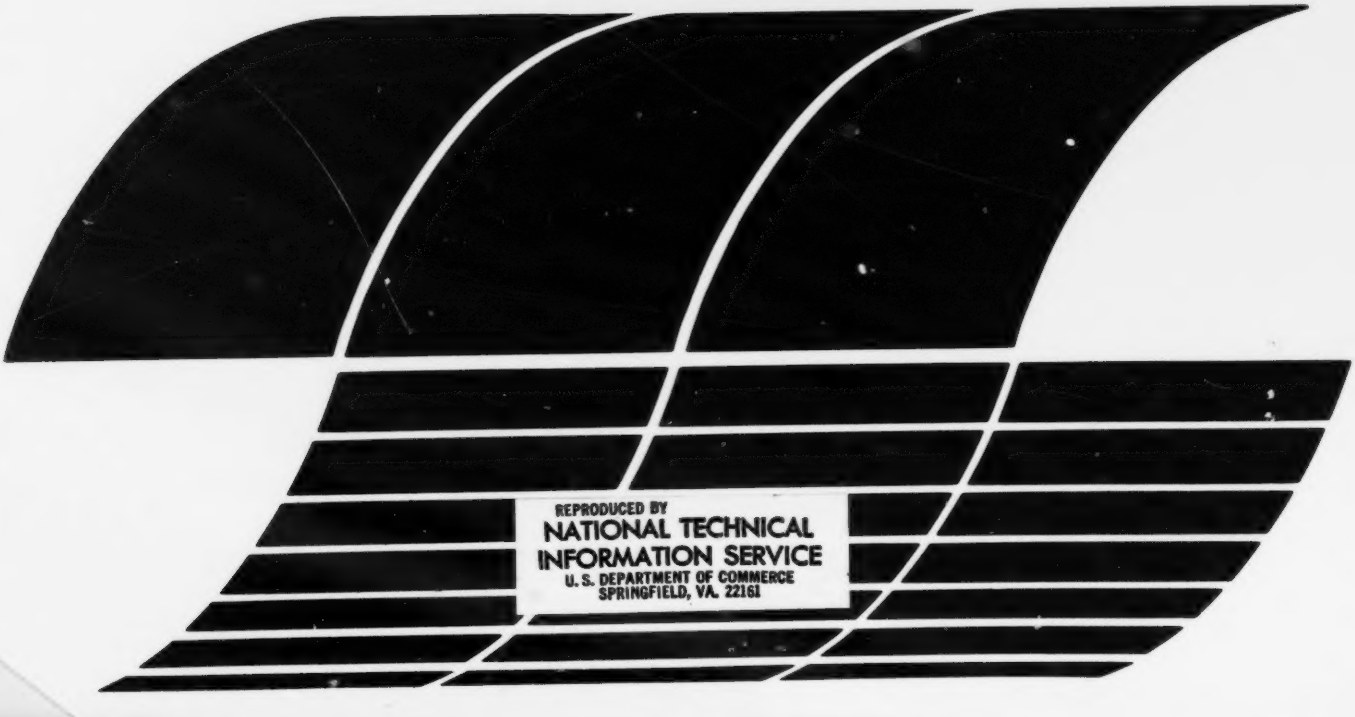

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OIL POLLUTION ABSTRACTS (formerly entitled OIL POLLUTION REPORTS) is a quarterly compilation of current literature and research project summaries. Comprehensive coverage of oil pollution and its prevention and control is provided, with emphasis on the aquatic environment. This issue contains bibliographic citations with abstracts of scientific and technical publications and patents covering the years 1976 to 1979. The literature and research entries are arranged in eight major categories comprised of thirty-seven specific sub-categories. A permuted Subject Keyword Index provides access to every entry, and author and patent indexes are included. This report is submitted in partial fulfillment of EPA Grant No. R-805803-01 by the Marine Science Institute, University of California, Santa Barbara, under the sponsorship of the U.S. Environmental Protection Agency.

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Abstracts Bibliographies Research Patents Subject indexes	Oil pollution Oil spill events Oil spill research Oil pollution control Oil pollution patents	13B

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OIL POLLUTION ABSTRACTS

Volume 6, Number 3
(July 1979 - September 1979)

by

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and David Bonvouloir

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FOREWORD

When energy and material resources are extracted, processed, converted, and used, the related pollutional impacts on our environment and even on our health often require that new and increasingly more efficient pollution control methods be used. The Industrial Environmental Research Laboratory - Cincinnati (IERL-Ci) assists in developing and demonstrating new and improved methodologies that will meet these needs both efficiently and economically.

This report is a product of the above efforts. It cites current literature, research, patents, and other materials relevant to the oil pollution abatement program and is published in an abstract format on a quarterly basis. As such, it serves as a basic reference document for all those interested in oil spill and oil pollution control. This project is part of the continuing program of the Oil and Hazardous Materials Spills Branch, IERL-Ci, to assess and mitigate the environmental impact of oil pollution.

David G. Stephan
Director
Industrial Environmental Research Laboratory
Cincinnati

ABSTRACT

OIL POLLUTION ABSTRACTS is a quarterly compilation of current literature and research project summaries. Comprehensive coverage of oil pollution and its prevention and control is provided, with emphasis on the aquatic environment. This issue contains bibliographic citations with abstracts of scientific and technical publications and patents covering the years 1976 to 1979. The literature and research entries are arranged in eight major categories comprised of thirty-seven specific sub-categories. A permuted Subject Keyword Index provides access to every entry, and author and patent indexes are included. This report is submitted in partial fulfillment of EPA Grant No. R-805803-01 by the Marine Science Institute, University of California, Santa Barbara, under the sponsorship of the US Environmental Protection Agency.

OIL POLLUTION ABSTRACTS - TOPICAL OUTLINE

A. OIL POLLUTION DETECTION AND EVALUATION
   1. Detection and Monitoring
   2. Remote Sensing
   3. Sampling and Analysis
   4. Source Identification

B. OIL POLLUTION PREVENTION AND CONTROL
   1. Containment
   2. Cleanup and Removal
   3. Environmental Restoration
   4. Personnel Training
   5. Contingency Planning and Spill Response
   6. Legal and Regulatory Aspects
   7. General Prevention and Control Measures

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
   1. Biological Aspects
   2. Physical and Chemical Aspects
   3. Social and Economic Aspects
   4. Environmental Response and Recovery
   5. Baseline and Environmental Impact Studies
   6. Legal and Regulatory Aspects
   7. General Aspects

D. FATE OF OIL IN THE ENVIRONMENT
   1. Biodegradation
   2. Physical and Chemical Processes
   3. Models, Simulations, and Predictions
   4. General Fate of Oil

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
   1. Biological Aspects
   2. Physical and Chemical Aspects
   3. Social and Economic Aspects
   4. Legal and Regulatory Aspects
   5. General Aspects

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE
   1. Tankers and Ships
   2. Pipelines
   3. Loading and Offloading Facilities
   4. Storage Facilities
   5. Legal and Regulatory Aspects
   6. General Aspects

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
   1. Waste Treatment and Disposal Methods
   2. Oil-Water Separation
   3. Waste Oil Reclamation and Reuse
   4. Legal and Regulatory Aspects

H. MISCELLANEOUS

CONTENTS

Page
Abstract iv

Topical Outline v

Acknowledgements x

Introduction xi

Serials Listings xii

Abbreviations - Acronyms xiii

I. Reports, Publications, and Patents

A. OIL POLLUTION DETECTION AND EVALUATION
1. Detection and Monitoring 1
2. Remote Sensing 5
3. Sampling and Analysis 9
4. Source Identification 22

B. OIL POLLUTION PREVENTION AND CONTROL
1. Containment 26
2. Cleanup and Removal 28
3. Environmental Restoration 44
4. Personnel Training 44
5. Contingency Planning and Spill Response 45
6. Legal and Regulatory Aspects 48
7. General Prevention and Control Measures 50

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects 54
2. Physical and Chemical Aspects 73
3. Social and Economic Aspects 74
4. Environmental Response and Recovery 74
5. Baseline and Environmental Impact Studies 75
6. Legal and Regulatory Aspects 83
7. General Aspects 84

Page

D. FATE OF OIL IN THE ENVIRONMENT
    1. Biodegradation 94
    2. Physical and Chemical Processes 100
    3. Models, Simulations, and Predictions 103
    4. General Fate of Oil 107

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION
    1. Biological Aspects 110
    2. Physical and Chemical Aspects 111
    3. Social and Economic Aspects 111
    4. Legal and Regulatory Aspects 112
    5. General Aspects 114

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE
    1. Tankers and Ships 124
    2. Pipelines 131
    3. Loading and Offloading Facilities 132
    4. Storage Facilities 135
    5. Legal and Regulatory Aspects 135
    6. General Aspects 137

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL
    1. Waste Treatment and Disposal Methods 139
    2. Oil-Water Separation 147
    3. Waste Oil Reclamation and Reuse 149
    4. Legal and Regulatory Aspects 151

H. MISCELLANEOUS 152

II. Current Research Projects 154

A. OIL POLLUTION DETECTION AND EVALUATION
    1. Remote Sensing 155
    2. Sampling and Analysis 156

B. OIL POLLUTION PREVENTION AND CONTROL
    (No Entries)

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
    1. Biological Aspects 159
    2. Baseline and Environmental Impact Studies 160

D. FATE OF OIL IN THE ENVIRONMENT
1. Biodegradation 161
2. Physical and Chemical Processes 161
3. Models, Simulations, and Predictions 163

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION
1. Biological Aspects 165

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE
1. Storage Facilities 166

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL
1. Waste Treatment and Disposal Methods 167

Guide to the Master List of Keywords and the Subject Keyword Index 168

Master List of Keywords 169

Subject Keyword Index 178

Author Index 222

Patent Index 228

Appendix A: Periodicals Reviewed 229

Appendix B: OIL POLLUTION ABSTRACTS Availability and Ordering Information 232

Technical Report Data Page 233

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INTRODUCTION

OIL POLLUTION ABSTRACTS is a quarterly abstracting series which reviews scientific and technical publications and research projects to inform readers about current developments in the field of oil pollution. This issue contains summaries of articles, reports, books, conference papers, patents, and other literature relating to oil pollution published after 1975 (Section I), and summaries of current research projects (Section II). Subject keyword, author, and patent indexes are included.

Subject coverage encompasses terrestrial and aquatic oil pollution, with emphasis on the marine environment. The citations in Section I are divided into nine major categories which are further divided into thirty-seven specific sub-categories (see p. v). A list of periodicals reviewed in preparing this series appears in Appendix A.

Section II presents titles of active or recently completed oil pollution research projects, summaries of project objectives, and information on the current status and publications resulting from the projects.

Each entry is provided with several descriptive terms selected from a controlled master list of approximately 400 keywords (see p. 168), and, if necessary, one or more specific free-language terms prefaced by an asterisk (*). The groups of keywords for each entry are alphabetically permuted by computer to form the Subject Keyword Index, permitting rapid access to every entry. OIL POLLUTION ABSTRACTS ordering information is included as Appendix B.

OIL POLLUTION ABSTRACTS*

Issues currently available, in press, or in preparation

*This series was formerly entitled:
OIL POLLUTION REPORTS (1978: Vol. 5, No. 2 to Vol. 5, No. 4)
OIL SPILL AND OIL POLLUTION REPORTS (1974 to 1978: Vol. 5, No. 1)

	DATES COVERED	REPORT NUMBER
1974	July 74 - Oct. 74	EPA-670/2-75-003
1975	Nov. 74 - Feb. 75	EPA-670/2-75-044
1975	Feb. 75 - Apr. 75	EPA-670/2-75-059
1975	May 75 - July 75	EPA-600/2-76-129
1975	Aug. 75 - Oct. 75	EPA-600/2-76-113
1976	Nov. 75 - Jan. 76	EPA-600/2-76-185
1976	Feb. 76 - Apr. 76	EPA-600/2-76-215
1976	May 76 - July 76	EPA-600/2-76-266
1976	Aug. 76 - Oct. 76	EPA-600/2-77-037
1977	Nov. 76 - Jan. 77	EPA-600/2-77-075
1977	Feb. 77 - Apr. 77	EPA-600/2-77-111
1977	May 77 - July 77	EPA-600/2-77-243
1977	Aug. 77 - Oct. 77	EPA-660/2-78-005
Vol. 5, No. 1	Nov. 77 - Jan. 78	EPA-600/2-78-071
Vol. 5, No. 2	Feb. 78 - May 78	EPA-600/7-78-160
Vol. 5, No. 3	June 78 - Sep. 78	EPA-600/7-78-218
Vol. 5, No. 4	Oct. 78 - Dec. 78	EPA-600/7-79-040
Vol. 6, No. 1	Jan. 79 - Mar. 79	Submitted 4/79
Vol. 6, No. 2	Apr. 79 - June 79	Submitted 7/79
Vol. 6, No. 3	July 79 - Sept 79	Submitted 10/79
Vol. 6, No. 4	Oct. 79 - Dec. 79	To be submitted 1/80

For complete ordering information, please see Appendix B.

ABBREVIATIONS/ACRONYMS

atm	atmosphere
bbl	barrel
C	carbon
°C	degrees Centigrade
cm	centimeter
COW	crude oil washing
DWP	deepwater port
dwt	dead weight ton
EIS	environmental impact statement
°F	degrees Fahrenheit
ft	foot
g	gram
gal	gallon
GC	gas chromatography
GLC	gas-liquid chromatography
gpd	gallons per day
gph	gallons per hour
gpm	gallons per minute
ha	hectare
hr	hour
in	inch
IR	infrared
kg	kilogram
km	kilometer
kn	knot
L	liter
lb	pound
LC	liquid chromatography
LD	lethal dose
LNG	liquefied natural gas
LOT	load on top
LPG	liquefied petroleum gas
m	meter
mg	milligram
mi	mile
min	minute
ml	milliliter
mm	millimeter
MS	mass spectrometry
N	nitrogen
N.A.	not available
nm	nautical mile
O	oxygen
OCS	outer continental shelf
OPA	OIL POLLUTION ABSTRACTS
oz	ounce
PAH	polycyclic aromatic hydrocarbon
pH	the negative log of the H ion concentration
ppb	parts per billion
ppm	parts per million
SBT	segregated ballast tank
sp.	species
TLC	thin-layer chromatography
UK	United Kingdom
US	United States
USSR	Union of Soviet Socialist Republics
UV	ultraviolet
VLCC	very large crude carrier
vs	versus
WSF	water soluble fraction
wt	weight
yr	year
μ	micron
μg	microgram
%	percent
/	per
~	approximately
>	greater than
<	less than

ABBREVIATIONS/ACRONYMS (continued)

API	American Petroleum Institute
ASTM	American Society for Testing and Materials
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
DOE	Department of Energy
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
FAO	Food and Agricultural Organization
FEA	Federal Energy Administration
IMCO	International Maritime Consultative Organization
NASA	National Aeronautics and Space Administration
NBS	National Bureau of Standards
NOAA	National Oceanic and Atmospheric Administration
NTIS	National Technical Information Service
OHMSETT	Oil and Hazardous Materials Simulated Environmental Test Tank
SSIE	Smithsonian Science Information Exchange
UN	United Nations
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	US Fish and Wildlife Service
USGS	United States Geological Survey
USN	United States Navy

SECTION I

REPORTS, PUBLICATIONS, AND PATENTS

A. OIL POLLUTION DETECTION AND EVALUATION

1. Detection and Monitoring

79C-0681
APPARATUS FOR THE CONTINUOUS DETECTION OF THE CONTAMINATION OF AN AQUEOUS LIQUID BY OIL
Berthold, R., and A. Lempe. 1978.
German Offenlegungsschriften (patent application) 2,657,851

Contamination, Oil slicks, Detection, Equipment, Design-engineering, Patent

A buoyant device for detecting the presence of floating oil on water operates by monitoring the oil luminescence induced by UV irradiation. The device comprises 2 pontoons with a Hg lamp as UV source and a photoresistor as a detector with a selective sensitivity for visible light. A second UV source-detector system monitors the luminescence of the subsurface liquid as a reference signal, thereby permitting the identification of oil contaminants.

[from Chemical Abstracts 89(16):#135277d. 1978]

79C-0682
DEVELOPMENT OF AN ENZYMIC ELECTRODE OIL IN WATER SENSOR
Cundell, A.M., N.J. Patni, and E. Findl. 1979.
Report ER-013179, Contract N00014-78-C0230. 24 p. Final report.

Detection, Hydrocarbons, Ships, Pollution control, Bacteria, Design-engineering, *Enzyme electrode

This document reports on the development of a hydrocarbon dioxygenase electrode oil-in-water sensor to detect low concentrations of petroleum hydrocarbons in bilge water. Overall, the study resulted in development of the instrumentation and test apparatus, techniques to assay dioxygenase activity, and procedures to cultivate selected hydrocarbon-consuming microorganisms.

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0683
A FEASIBILITY STUDY OF SURFACE TECHNIQUES FOR THE DETECTION OF OIL UNDER ICE
Gill, R.J., T.E. Keliher, J.R. Rossiter, N.H. Rich, and M.P. Bruce-Lockhart. 1979.
Spill Technology Newsletter 4(2):57-68.

Oil spills, Ice, Detection, Cold climates

The following methods were applied to determine the feasibility of their application to the detection of oil in and under ice: radio frequency and radar, acoustics, nuclear techniques, optical and spectroscopic means, and gas sniffer. Of the five techniques tested, the optical and spectroscopic, and gas sniffer methods were least applicable. Acoustic and radar techniques were the most preferred, being lighter and more portable, far less expense, and safer than nuclear techniques.

79C-0684
WHAT'S A NICE PHYSICIST LIKE YOU DOING IN AN ENVIRONMENT LIKE THIS?
Inhaber, H. 1976.
Technology Review 79(1):54-61.

Detection, Oil slicks, Crude oil, Sea surface, Physical aspects, *Capacitance, *Laser reflectance

Some of the ways in which physics can help to measure and control environmental problems are discussed. Included is a description of one physicist's approach to measuring the differences between seawater and crude oil as a means of detecting spilled oil, based on the different capacitances of oil and water. Another approach involves the use of laser beams for detecting thin oil slicks.

79C-0685
METHODS AND STANDARDS FOR ENVIRONMENTAL MEASUREMENT. PROCEEDINGS OF THE MATERIALS RESEARCH SYMPOSIUM (8TH) HELD AT THE NATIONAL BUREAU OF STANDARDS, GAITHERSBURG, MARYLAND, ON SEPTEMBER 20-24, 1976
KIRCHOFF, W.H. 1977.
Report NBS-SP-464. 653 p. Final report.

Analytical techniques, Detection, Hydrocarbons, Refineries, *Proceedings

This book presents detailed abstracts on a wide number of topics related to the detection and analysis of environmental pollutants including hydrocarbons, refinery wastes, and others. It provides an extensive listing of reference materials for environmental measurement.

[from Government Reports Announcements 78(5):107. #PB-275 008. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0686
CONTINUOUS BIOMONITORING SYSTEMS FOR DETECTION OF TOXIC LEVELS OF WATER POLLUTANTS
Koeman, J.H., et al. 1977.
International 2nd Symposium on Aquatic Pollutants, Amsterdam, 26-28 September 1977. p. 339-347.

Monitoring, Biological effects, Contamination, Toxicity, Detection, Bioindicators

Changes in biological response of test species, in biomonitoring models, reflect a meaningful change in the chemical and physical conditions of the water. The use of these tests for qualitative and quantitative assessment of toxic pollutants in water is evaluated. [possibly oil pollution related]

[from Environmental Abstracts 9(2):#79-00878. 1979]

79C-0687
AN EFFICIENT COMPUTATIONAL ALTERNATIVE TO 'USING LINEAR PROGRAMMING TO DESIGN OIL POLLUTION DETECTION SCHEDULES'
Lee, E., S. Hart, and T.J. Hodgson. 1977.
Report RR-77-9, Contract N00014-76-C-0096. 16 p. Research report.

Detection, Models, Oil spills, Movement, Monitoring, Remote sensing

The Markov Decision Process model has been reformulated to make a significant improvement on the design of oil pollution detection schedules previously found using linear programming. In this approach a discrete time semi-Markov process is used.

[from Government Reports Announcements 78(4):185. #AD-A047 028. 1978]

79C-0688
THE IGOSS PILOT PROJECT ON MARINE POLLUTION (PETROLEUM) MONITORING: ITS EVOLUTION AND A PERSONAL VIEWPOINT
Levy, E.M. 1979.
Marine Pollution Bulletin 10(1):5-11.

Monitoring, Oil spills, Contingency planning, International agreements, Resource management, *IGOSS

This article traces the development of the worldwide Integrated Global Ocean Station System (IGOSS) pollution monitoring project, details difficulties encountered and their solutions, and offers a personal opinion of the project. Included are discussions of implementation procedures, roles of the IGOSS team, and future development alternatives.

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0689
GAS CHROMATOGRAPHIC DETECTION OF SOME SOLVENTS IN WASTE WATER USING THE HEAD-SPACE TECHNIQUE [English summary]
Mattes, L., and N. Vreden. 1978.
Forum Staedte Hygiene 29(2):37-40.

Detection, Chromatography, Petroleum products, Wastewaters, *Head-space method

Motor oils, gasoline and other substances were detected by the head-space gas chromatographic technique in sewage effluents.

[from Chemical Abstracts 89(18):#151956e. 1978]

79C-0690
A NOVEL BIOPSY TECHNIQUE FOR MONITORING ENVIRONMENTAL CONTAMINANTS IN FISH
Moy, D.C., and M.C.L. Dredge. 1979.
Bulletin of Environmental Contamination and Toxicology 22(1/2):35-37.

Monitoring, Contamination, Analytical techniques, Uptake, Toxicity, Fish, *Biopsy

Presented is a simple technique for tagging and extracting a small piece of musculature of small fish. The tissue extraction is effected by use of a 16 gauge stainless steel needle of 15° taper attached by a Luer fitting to a 20 ml disposable plastic syringe. Methods, problems encountered, and discussion of the technique are presented.

79C-0691
DETECTION DEVICE FOR OIL FLOATING ON WATER
Ohtsu, T., Y. Nakamura, and A. Sugimoto. 1978.
Canadian Patent 1,042,682

Detection, Equipment, Design-engineering, Patent

The device consists of the following: 1) a container having one opening; 2) a water repellant, oil-passing filter member closing this opening; and 3) an electrically conductive particle layer formed of carbon, metal oxides and metal. When the particle layer is soaked with oil which has passed through the filtering member, the oil comes in contact with the conductive particles and causes the electrical resistance of the particle layer to increase.

[from Petroleum Abstracts 19(14):#216,492. 1979]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0692
APPARATUS FOR DETERMINING THE PRESENCE OF A FLUID SUCH AS OIL, ON WATER
Potter, B.M. 1978.
German Offenlegungsschriften (patent application) 2,756,872

Detection, Oil slicks, Equipment, Design-engineering, Patent

The title apparatus comprises a sensor with temperature-dependent electric conductance, and a means of heating the sensor so that the different thermal conductivities of oil and water can be measured. A reference sensor in oil-free water is connected with, and synchronously heated with the detection device to provide continuous calibration.

[from Chemical Abstracts 89(18):#152534c. 1978]

79C-0693
THE PETROLEUM-INDUCIBLE MIXED-FUNCTION OXIDASE OF CUNNER (TAUTOGOLABRUS ADSPERSUS WALBAUM 1972): SOME CHARACTERISTICS RELEVANT TO HYDROCARBON MONITORING
Walton, D.G., W.R. Penrose, and J.M. Green. 1978.
Journal of the Fisheries Research Board of Canada 35(12):1547-1552.

Hydrocarbons, Bioindicators, Monitoring, Metabolism, Fish, *Tautogolabrus adspersus, *Aryl hydrocarbon hydroxylase

The hepatic aryl hydrocarbon hydroxylase of the cunner is a sensitive indicator of petroleum contamination. The study shows effects of different concentrations of oil in water (1-2 mg/L) and in food (500 mg/kg) on the level of this enzyme. Guidelines for use of the cunner as a monitoring medium are presented.

2. Remote Sensing

79C-0694
OIL DETECTION SYSTEM ANNOUNCED [news brief]
Anon. 1979.
World Dredging and Marine Construction 13(10):41.

Remote sensing, USCG, Surveillance, Detection, *Radar system

The US Coast Guard has begun operating an airborne sidelooking radar and passive microwave imaging system to detect illegal discharges of oil in nearly all types of weather, day or night. Called the Airborne Oil Surveillance System (AOSS), the system locates and maps oil spills within a 40 km (25 mi) wide swath along the aircraft's path. A multichannel line scanner provides clean images of oily discharges and identifies suspected violators.

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0695
SLICK RADAR OUTWITS POLLUTERS [news brief]
Anon. 1979.
New Scientist 81(1147):954.

Remote sensing, Detection, Monitoring, Oil slicks, Tankers, Ships, Sweden

The Swedish Coast Guard is using a side-looking radar system to detect and monitor oil pollution from tankers. The airplane-mounted unit, weighing only 70 kg, is capable of detecting slicks of a little as 100 L and can detect medium-size ships from 100 km distance.

79C-0696
FOURTH JOINT CONFERENCE ON THE SENSING OF ENVIRONMENTAL POLLUTANTS
American Chemical Society. 1978.
Washington, DC, American Chemical Society, 1978. xvii + 945 p.

Remote sensing, Hydrocarbons, Oil slicks, Detection, Monitoring, *Proceedings

Presented are 242 technical papers and several panel discussions from the title conference, held in New Orleans, Louisiana on 6-11 November 1977. Included are papers by G.W. Grew, R.D. Watson et al., V. Zitko, and A.R. Barringer et al., which deal with remote sensing, monitoring or detection of oil slicks or hydrocarbons.

79C-0697
DEVELOPMENT OF AN AIRBORNE LASER FLUOROSENSOR FOR OIL AND WATER POLLUTION MONITORING
Barringer, A.R., J.H. Davies, and R. Dick. 1978.
Joint Conference on the Sensing of Environmental Pollutants, 4th, New Orleans, 6-11 November 1977. Washington, DC, American Chemical Society, 1978. p. 778-781.

Remote sensing, Analytical techniques, Monitoring, Detection, *Airborne laser

A recently developed laser fluorosensor which utilizes a one megawatt pulsed nitrogen laser to monitor targets on water from an altitude of 300 to 600 m (1,000 to 2,000 ft) is described. The major applications for the instrument include oil spill classification, water pollution monitoring and hydrologic studies.

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0698
SIGNATURE EXTRACTION OF OCEAN POLLUTANTS BY EIGENMOTOR TRANSFORMATION OF REMOTE SPECTRA
Grew, G.W. 1978.
Joint Conference on the Sensing of Environmental Pollutants, 4th, New Orleans, 6-11 November 1977. Washington, DC, American Chemical Society, 1978. p. 659-666.

Remote sensing, Analytical techniques, Monitoring, Detection, Source identification, *Spectral signatures

Characteristic vector analysis of remote ocean color data collected with a Multichannel Ocean Color Sensor (MOCS) has resulted in identification of signatures of suspended matter in the oceans. The relationships between eigenvectors and spectral signatures for various pollutants, including oil, are examined.

79C-0699
CONTROL OF OIL POLLUTION BY REMOTE SENSING ALONG THE SHORES OF FRANCE
Mourlon, J.C. 1978.
International Symposium on Remote Sensing of Environment, 12th, Ann Arbor, Michigan, 20-26 April 1978, Vol. 1. p. 235-238.

Remote sensing, Surveillance, Pollution control, Coastal waters, France

Airborne pollution surveillance systems used for pollution control in France are discussed.

[from Petroleum Abstracts 19(13):#261,202. 1979]

79C-0700
APPARENT CONTRAST OF AN ATMOSPHERE-OCEAN SYSTEM WITH AN OIL POLLUTED SEA SURFACE
Mukai, S., and S. Ueno. 1978.
Applied Mathematical Modelling 2(4):254-260.

Remote sensing, Models, Sea surface, Detection

To obtain optical thickness of ocean waters and detect pollution of the sea surface remotely by satellite, the intensity of radiation from a model atmosphere-ocean was measured using the superposition method. It is demonstrated that the visibility of oil polluted ocean waters is higher than that of uncontaminated ocean. Based on this enhancement, sea pollution could be detected from space.

[from Environment Abstracts 9(3):#79-01785. 1979]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0701
REMOTE SENSING OF OIL SPILLS
Neville, R.A., V. Thomson, R.A. O'Neil, L. Buja-Bijunas, et al. 1979.
Spill Technology Newsletter 4(2):111-146.

Remote sensing, Oil spills, Physical aspects, Behavior, Sea surface, Performance testing, Canada

Recent experiments undertaken by the Canada Centre for Remote Sensing and as part of the Canadian AMOP program are summarized. Oil physically interacts with the water surface in five ways which can be exploited by various sensors to detect its presence. These are the suppression of capillary waves, an increased surface reflectance in the near UV to near-IR, a change in the thermal emissivity and/or temperature, the emission of fluorescence radiation that characterizes oil, and an increase in the microwave activity. This article details the results of field tests of these five methods.

79C-0702
PROTOTYPE ACTIVE SCANNER FOR NIGHTTIME OIL SPILL MAPPING AND CLASSIFICATION
Sandness, G.A., and S.B. Ailes. 1977.
International Symposium on Remote Sensing of Environment, 11th, Ann Arbor, Michigan, 25-29 April 1977, Vol. 2. p. 1445-1452.

Remote sensing, Oil spills, Detection, Surveillance

"A prototype, active, aerial scanner system has been constructed for nighttime water pollution detection and nighttime multispectral imaging of the ground. An arc lamp is used to produce the transmitted light and 4 detector channels provide a multispectral measurement capability. The feasibility of the design concept has been demonstrated by laboratory and flight tests of the prototype system."

79C-0703
SATELLITE REMOTE SENSING STUDY OF TRANS-BOUNDARY MOVEMENTS OF POLLUTANTS
Wezernak, C.T., and D.R. Lyzenga. 1977.
Report ERIM-115100-2-F, EPA/600/3-77/056, Grant EPA-R-803671. 28 p.
Final report.

Remote sensing, Detection, Monitoring, Movement, Great Lakes, *LANDSAT, *ERTS

The results of this study, based on a limited analysis of ERTS (LANDSAT) of the western basin of Lake Erie, demonstrated the potential of satellite sensing for monitoring large bodies of water. [possibly oil pollution related]

[from Government Reports Announcements 78(02):165. #PB-274 069. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0704
REMOTE SENSING FOR OIL POLLUTION CONTROL ALONG COASTAL WATERS OF THE UNITED STATES
White, J., and L.R. Breslau. 1978.
International Symposium on Remote Sensing of Environment, 12th, Ann Arbor, Michigan, 20-26 April 1978. Vol. 1. p. 231-255.

Remote sensing, Surveillance, USCG, Pollution control, Coastal waters

The Airborne Oil Surveillance System-II used by the US Coast Guard is discussed and the requirements of such a system are outlined.

[from Petroleum Abstracts 19(13):#261,203. 1979]

3. Sampling and Analysis

79C-0705
THE ANALYSIS OF THE HYDROCARBONS OF PETROLEUM
Aldridge, A.K., P.W. Brooks, G. Eglinton, and J.R. Maxwell. 1977.
Genesis of Petroleum and Microbiological Means for Its Recovery [Papers presented at the Microbiology Group Symposium, 1976]. London, Institute of Petroleum, 1977. p. 4-21.

Chemical analysis, Chromatography, Spectrometry, Hydrocarbons, Sources

"The methods, e.g., fractionation, gas-liquid chromatography, gas chromatography-mass spectrometry (GC-MS), for the analysis of hydrocarbons of petroleum are described to obtain information about source rock correlations, oil field evaluation, and pollution. The capillary computerized CG-MS is the best analytical technique."

[from Chemical Abstracts 89(16):#131938x. 1978]

79C-0706
GAS CHROMATOGRAPHIC ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS
Beernaert, H. 1979.
Journal of Chromatography 173(1):109-118.

Analytical techniques, PAH, Detection, Chromatography

"The use of high-resolution capillary columns for the separation of polynuclear aromatic hydrocarbons (PAHs) by gas chromatography is described." The GC detection of 5 ng of 10 PAHs indicated that the glass capillary column allows a limit of 0.5 ng.

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0707
ROUTE LIQUID CHROMATOGRAPHIC METHOD FOR ASSESSING POLYNUCLEAR AROMATIC HYDROCARBON POLLUTION IN FRESHWATER ENVIRONMENTS
Black, J.J., P.O. Dymerski, and W.F. Zapisek. 1979.
Bulletin of Environmental Contamination and Toxicology 22(1/2):278-284.

Analytical techniques, PAH, Detection, Sampling, Chromatography, Sediments, Freshwater

Described is the method employed for assessing the relative degree of polynuclear aromatic hydrocarbon (PAH) pollution in freshwater environments using a technique incorporating alkaline digestion and partitioning steps to analyze bottom sediments.

79C-0708
AZZARINES IN RECENT MARINE SEDIMENTS
Blumer, M., J. Sass, and T. Dorsey. 1977.
Report WHOI-77-35, WHOI-CONTRIB-3673, Contract N00014-66-C-0241, Grant NSF-DES-74-22781. 6 p.

Hydrocarbons, Biogenic hydrocarbons, Chemical analysis, Detection, Environmental effects, Sediments

Chemical fractionization and mass spectral probe distillation reveal the presence in recent marine sediments of a complex assemblage of nitrogen-containing aromatic compounds. The analytical, geochemical and environmental implications of these findings are discussed.

[from Government Reports Announcements 78(6):114. #AD-A048 087. 1976]

79C-0709
OIL POLLUTION - SOURCES AND CHARACTERIZATION
Boeler, J.C. 1978.
Kjemi 38(1):35-36.

Source identification, Oil spills, Sources, Analytical techniques, Norway

"The review with no references, covers sources of oil pollution and analytical methods used in Norway."

[from Chemical Abstracts 89(18):#151608t. 1978]

79C-0710
DETERMINATION OF OIL AND OIL DERIVATIVES IN SEA WATER [English summary]
Bonevski, R. 1977.
Arhiv za Higijenu Rada i Toksikologiju 28(4):351-360.

Chemical analysis, Petroleum products, Petrochemicals, Detection, *Fluorescence

Three modifications of fluorescence measurement (extraction, adsorption on filter paper, and filtration through filter paper) makes the method suitable for identifying unknown kinds of oil derivatives in seawater and for the quantitation of known oil derivatives. The method is based on the ability of oil and its derivatives (boiling point >150° C) to fluoresce after excitation at wavelength 365 μm.

[from Chemical Abstracts 89(18):#152383c. 1978]

79C-0711
QUALITY ASSURANCE PROGRAM FOR TRACE HYDROCARBON ANALYSIS
Chesler, S.N., H.S. Hertz, W.E. May, and S.A. Wise. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 13. p. 1-14.

Hydrocarbons, Analytical techniques, Chromatography, NOAA

The methodologies used for hydrocarbon analyses by NOAA laboratories and contractors were evaluated so that a basis for comparison of data obtained in different laboratories could be assured. The results are given in this report.

[from Petroleum Abstracts 19(9):#260,089. 1979]

79C-0712
DISTRIBUTION OF LIGHT HYDROCARBONS, C1-14, IN THE NORTHEAST GULF OF ALASKA, LOWER COOK INLET, SOUTHEASTERN BERING SHELF, NORTON SOUND, AND SOUTHEASTERN CHUKCHI SEA
Cline, J. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 13. p. 180-286.

Hydrocarbons, Biogenic hydrocarbons, Distribution, Natural seeps, Monitoring, OCS, Baseline studies, Alaska

A survey was undertaken to establish the baseline levels of naturally-occurring and petroleum-derived hydrocarbons prior to development of oil and gas resources in the title areas. Natural seeps were studied to determine their hydrocarbon compositions and to evaluate the merits of naturally injected low molecular weight hydrocarbons as tracers of petroleum input.

[from Petroleum Abstracts 19(9):#260,090. 1979]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0713
IMPROVED METHODS IN OIL IN WATER ANALYSIS
Cook, P.P., P.M. Duvall, and R.C. Bourke. 1978.
Water and Sewage Works, April 1978, Reference Number:71-72, 74, 76, 78.

Sampling, Analytical techniques, Detection, *Oil-in-water analysis

"A method for determining total oil and grease in water is modified for future use as a baseline for evaluating other measurement methods. The amount of extraction solvent, the extraction time, and the amount of water adsorption on the weighing flasks must be carefully considered."

[from Environment Abstracts 8(9):#78-04825. 1978]

79C-0714
CHEMICAL AND PHYSICAL PROPERTIES OF REFINED PETROLEUM PRODUCTS
Curl, H., Jr., and K. O'Donnel. 1977.
Report NOAA-TM-ERL-MESA-17, NOAA-77122003. 36 p.

Chemical analysis, Physical Aspects, Petroleum products, Toxicity, Evaporation

The chemical, physical, and toxic properties of refined petroleum products are examined. General findings indicate that the most toxic components of fuel oils are the aromatics, that hydrocarbons of lower molecular weight are more soluble than those with higher molecular weights, and that under normal wind and wave conditions, the evaporation rate of spilled oil can be significant.

[from Government Reports Announcements 78(8):265. #PB-277 100. 1978]

79C-0715
ANALYTICAL AND BIOLOGICAL ANALYSES OF TEST MATERIALS FROM THE SYNTHETIC FUEL TECHNOLOGIES. I. MUTAGENICITY OF CRUDE OILS DETERMINED BY THE SALMONELLA TYPHIMURIUM/MICROSOMAL ACTIVATION SYSTEM
Epler, J.C., J.A. Young, A.A. Hardigree, T.K. Rao, et al. 1978.
Mutation Research 57(3):265-276.

Analytical techniques, Mutagens, PAH, Crude oil, Microorganisms, *Salmonella typhimurium/microsomal activation

Natural crude oils and crude products from coal conversion processes were tested for mutagenicity using the title system. Total mutagenic activity of synthetic fuel samples was consistently higher than that of natural crudes. Activities of the PAHs and other subfractions are roughly additive and presumably reflect the mutagenic potential of the whole test material.

[from Chemical Abstracts 89(15):#124135e. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0716
MULTIDETECTION APPROACH TO ANALYSIS OF ORGANIC POLLUTANTS IN WATER. METHODS AND COMMENTS ON RESULTS
Errand, R., M. Mazza, and P. Payen. 1978.
Aquatic Pollutants: Transformation and Biological Effects. Proceedings of the Second International Symposium on Aquatic Pollutants, Amsterdam, 26-28 September 1977. O. Hutzinger, L.H. Van Lelyveld, and B.C.J. Zoeteman (eds.). Oxford, Pergamon Press, 1978. p. 87-99.

Analytical techniques, Chromatography, GC/MS, Detection, Hydrocarbons, Freshwater, *Flame ionization, *Flame photometry

Concentrated extracts of French freshwaters were analyzed. Gas chromatography was used with a flame ionization channel. GC/MS was used for pollutant identification. More than 100 compounds in 30 different classes were identified.

79C-0717
THE ULTRASONIC DISPERSION, SOURCE IDENTIFICATION, AND QUANTITATIVE ANALYSIS OF PETROLEUM OILS IN WATER
Gruenfeld, M., and R. Frederick. 1977.
Report EPA/600/J-77/113. 8 p. Journal article.

Analytical techniques, Source identification, Hydrocarbons, Dispersion

Three projects are discussed which developed methods for the quantification and source identification of water-dispersed oils, and for preparing stable oil-in-water dispersions.

[from Government Reports Announcements 78(13):144. #PB-278 589. 1978]

79C-0718
ANALYSIS OF HYDROCARBONS IN THE FOAM FROM WATER SLUICES
Hellmann, H. 1977.
Vom Wasser, Vol. 48:129-141.

Chemical analysis, Spectroscopy, Chromatography, Hydrocarbons, Weathering, Biodegradation, *Water sluices

IR spectroscopy and gas and thin-layer chromatography are useful for the title analysis. Changes in these hydrocarbons through weathering, biodegradation, UV radiation, and the presence of other natural substances complicates the correlation of sample parameters and those of the pollutant hydrocarbons.

[from Chemical Abstracts 89(16):#135504a. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0719
CHARACTERIZATION OF TAR BALLS BY GAS CHROMATOGRAPHY [in Japanese]
Higashi, K., C. Igarashi, and K. Hagiwara. 1978.
Bunseki Kagaku 27(3):177-180.

Chemical analysis, Chromatography, Tar, Hydrocarbons, Source identification

"Tar balls collected on the sea or beach were analyzed by temperature programmed gas chromatography. A comparison of n-alkane peaks in the chromatographs obtained for known samples with those obtained for the tar balls was used to detect their origin."

[from Chemical Abstracts 89(14):#117341r. 1978]

79C-0720
APPLICATION OF CAPILLARY GAS CHROMATOGRAPHY IN THE ANALYSIS OF HYDROCARBONS IN THE ENVIRONMENT
Jeltes, R., E. Burghardt, T.H. Thijsse, and W.A.M. Den Tonkelaar. 1977.
International Symposium on Glass Capillary Chromatography, 2nd, 1977.
R.E. Kaiser (ed.). Bad Duerkheim, West Germany, Institute of Chromatography, 1977. p. 147-168.

Chemical analysis, Chromatography, Hydrocarbons, Soil

"Hydrocarbons in air, soil, and H_2O were identified by capillary gas chromatography. The operation conditions of the chromatograph are given."

[from Chemical Abstracts 89(18):#151661e. 1978]

79C-0721
PATTERN RECOGNITION OF OUTPUT FROM GC-MS-COM FOR CRUDE OIL CLASSIFICATION
Koons, C.B., M.A. Rogers, J.N. Mercer, D.A. Flory, et al. 1977.
Genesis of Petroleum and Microbiological Means for Its Recovery. [Papers presented at the Microbiology Group Symposium, 1976]. London, Institute of Petroleum, 1977. p. 151-161.

Crude oil, Analytical techniques, GC/MS

"A procedure was developed for identifying and classifying crude oils by the use of computerized gas chromatography-mass spectroscopy (GC-MS-COM). Specific ions indicative of indigenous biological markers (steranes and triterpanes) are monitored. The patterns or distributions of peaks given by such compounds are used in classifying the crude oils."

[from Chemical Abstracts 89(16):#131908n. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0722
METHODS FOR THE ISOLATION AND IDENTIFICATION OF POLYCYCLIC AROMATIC HYDROCARBONS FOUND IN COMPLEX MIXTURES AND THE DETERMINATION OF THEIR POSSIBLE TOXICITY BY MEANS OF A HOST MEDIATED BIOASSAY TECHNIQUE
Lipsky, S., G. Alexander, W. McMurray, and R. Capizzi. 1977.
Report C0012958-1, Contract EY-76-S-02-2958. 58 p. Progress report, 1 July 1976 - 1 February 1977.

PAH, Analytical techniques, Chromatography, Bioassay, Toxicity

Techniques were developed to produce excellent high performance glass capillary columns for gas chromatographic analysis of a wide range of complex mixtures of organic compounds including those containing a wide range of PAHs.

[from Government Reports Announcements 78(6):90. #COO/2958-1. 1978]

79C-0723
ORGANICS AT THE AIR-WATER INTERFACE OF LAKE PONTCHARTRAIN
McFall, J.A., W. Huang, and J.L. Laseter. 1979.
Bulletin of Environmental Contamination and Toxicology 22(1/2):80-87.

Analytical techniques, PAH, Detection, Chromatography, Lakes, Louisiana, *Air-water interface

This study was designed to identify and determine concentrations of specific organic pollutants at the air/water interface of a lake heavily impacted by surrounding activities. GC analysis identified both substituted and unsubstituted PAHs although they were not the predominant class of compounds. [possibly oil pollution related]

79C-0724
STATISTICAL CONSIDERATIONS OF OIL IDENTIFICATION BY INFRARED SPECTROSCOPY
Mattson, J.S. 1977.
Proceedings, Workshop on Pattern Recognition Applied to Oil Identification, Coronado, California, 1976. Piscataway, New Jersey, Institute of Electronics and Electrical Engineers, 1977. p. 113-121.

Statistics, Spectroscopy, Petroleum products, Statistical analysis

Multivariate normal statistics were applied in studying the IR spectra of 204 samples of oils, (including lubricating oils, distillate and residual fuels, crude oils and waste automotive crankcase oils) for oil classification and identification. This article discusses the various statistical parameters and methods used in grouping the oils into 6 classes, based solely on infrared spectral data.

[from Chemical Abstracts 89(16):#131906k. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0725
ALKANES IN FISH FROM THE BUCCANEER OILFIELD
Middleditch, B.S., E.S. Chang, B. Basile, and S. Missler. 1979.
Bulletin of Environmental Contamination and Toxicology 22(1/2):249-257.

Sampling, Analytical techniques, Fish, Hydrocarbons, Concentrations, Offshore, Gulf of Mexico, *Buccaneer oilfield, *Alkanes

Twenty-five species of fish were examined to determine alkane concentrations by silica gel chromatography of flesh samples, including subcutaneous fat. A tabulation indicates species, location where fish were caught, the type of tissue examined and alkanes in ppm. Concentrations in muscle tissue ranged from 0 to 16 ppm, and in livers from 0 to 1,300 ppm. Specific identification of petroleum alkanes in each species is listed.

79C-0726
ALKANES IN PLANKTON FROM THE BUCCANEER OILFIELD
Middleditch, G.S., E.S. Chang, and B. Basile. 1979.
Bulletin of Environmental Contamination and Toxicology 21(3):421-427.

Sampling, Oil discharges, Concentrations, Plankton, Biogenic hydrocarbons, Offshore, Gulf of Mexico, *Buccaneer oilfield, *Alkanes

Sixteen samples of zooplankton collected in 1976 were examined for presence of petroleum alkanes and whether they might contribute significantly to the dispersion of oil discharged from the production platforms. The presence of pristane and biogenic alkanes in each sample "is believed to be good evidence for petroleum contamination."

79C-0727
ALKANES IN SEAWATER IN THE VICINITY OF THE BUCCANEER OILFIELD
Middleditch, B.S., B. Basile, and E.S. Chang. 1979.
Bulletin of Environmental Contamination and Toxicology 21(3):413-420.

Sampling, Oil discharges, Hydrocarbons, Concentrations, Offshore, Platforms, Gulf of Mexico, *Buccaneer oilfield, *Alkanes

Data generated from 76 water samples collected up to 20 km from the center of the oilfield and subjected to GC and GC/MS analysis indicated concentrations of alkanes to be as high as 43 ppb. "It appears that petroleum alkanes discharged from the production platforms float at the air/sea interface and are dispersed." Rate and causes of dispersion remain to be determined.

79C-0728
ALKANES IN SURFICIAL SEDIMENTS FROM THE REGION OF THE BUCCANEER OILFIELD
Middleditch, B.S. and B. Basile. 1979.
Journal of Chromatography 158(1):449-463.

Sampling, Oil discharges, Sediments, Biogenic hydrocarbons, Offshore, Gulf of Mexico, *Buccaneer oilfield, *Alkanes

Surficial sediment samples collected below Buccaneer oilfield production platforms contain up to 25 ppm of petroleum alkanes. Examples of fresh oil and dispersed (weathered) gradients are discussed. Alkanes in samples collected at distances of 0.7-11.0 km from the platform were mostly of recent biogenic origin.

79C-0729
USE OF FLUORESCENCE SPECTROPHOTOMETRY FOR ANALYZING PETROLEUM PRODUCTS IN WATER [English summary]
Minarik, Z. 1978.
Vodni Hospodarstvi B 28(5):134-139.

Detection, Chemical analysis, Spectrometry, Petroleum products, *Fluorescence spectrophotometry

Diverse petroleum products were detected in water with the title process. "There are 2 groups of petroleum fractions in regard to their maximum of fluorescence: 1st, with maximum at 330-340 nanometers, are crude oil, gasoline, kerosine, and fuel oil; then, with a maximum at 370-380 nanometers are engine oil, gear oil, bearing oil and compressor oil."

[from Chemical Abstracts 89(18):#149107k. 1978]

79C-0730
LIQUID CHROMATOGRAPHY OF HYDROCARBONS ON POROUS POLY-(ETHYLENE GLYCOL) METHACRYLATE (SPHERON P-300)
Minárik, M. and R. Komers. 1978.
Journal of Chromatography 148(1):175-181.

Analytical techniques, Aromatic hydrocarbons, Detection, Chromatography

"The chromatographic behavior of saturated, unsaturated and aromatic hydrocarbons was studied on a macroporous bead copolymer of 2-hydroxyethyl methacrylate and ethylene dimethacrylate, with n-heptane as the mobile phase." It was concluded that the separation mechanism of liquid-liquid chromatography better interpreted the chromatographic properties of conjugated unsaturated and aromatic hydrocarbons.

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0731
MICRODETERMINATION OF PETROLEUM PRODUCTS IN WATER
Moursy, A.S. 1976.
9th Arab Petrol. Congr., Dubai, 10-16 March 1975. Preprint No. 124(B-1). 8 p.

Chemical analysis, Petroleum products, Chromatography, *Gravimetric analysis

"A wet extraction procedure for quantitative microdetermination and classification of petroleum and its products is introduced. The method is based on the extraction of petroleum from water followed by thin-layer chromatographic analysis of the extract obtained. The extracted petroleum is thus resolved into oils, resins, and asphaltenic components, which are gravimetrically determined."

[from Petroleum Abstracts 19(13):#261,206. 1979]

79C-0732
POLYCYCLIC AROMATIC HYDROCARBONS
National Cancer Institute. 1978.
Report NCI/ICRDB/SL-77/117. 46 p. (Special listing)

PAH, Chemical analysis, Health hazards, Mutagens, Carcinogens, Metabolism

This special listing contains descriptions of ongoing research projects related to PAHs. Research topics include: Metabolism of action of aromatic hydrocarbons, cell transformation by aromatic hydrocarbons, immunological aspects of aromatic hydrocarbon carcinogenesis, other biochemical effects of PAH's, detection, synthesis, reactions and molecular structure of PAH's and their derivatives.

[from Government Reports Announcements 78(16):104. #NTISUB/D/296-004. 1978]

79C-0733
PHYSICO-CHEMICAL METHODS USED IN THE USSR FOR THE DETERMINATION OF CHEMICAL POLLUTION IN SEA WATER
Oradovskii, S.G. 1977.
Ambio Special Report, Vol. 5:287-289.

Chemical analysis, Contamination, Hydrocarbons, Seawater, Phytoplankton, Chromatography, USSR

Characteristics of gas-chromatographic methods are given for the detection of petroleum hydrocarbons and other pollutants. These methods are applied in studies of seawater self-purification processes and effects of pollutants on phytoplankton.

[from Chemical Abstracts 89(16):#135533j. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0734
ISOLATION OF ORGANIC WATER POLLUTANTS BY XAD RESINS AND CARBONS
Rossum, P.V. 1978.
Journal of Chromatography 150(2):381-392.

Analytical techniques, Detection, *XAD resins

Recovery efficiencies of several XAD resins were measured using distilled water samples containing 13 organic pollutants. An equal weight mixture of XAD-4 and XAD-8 was most efficient. Related findings are discussed. [possibly oil pollution related]

79C-0735
A SIMPLE METHOD FOR SCREENING PETROLEUM EFFLUENTS BY IN VITRO ENZYME INHIBITION
Rutherford, C.L., A.L. Buikema, D.R. Armant, and J. Cairns. 1979.
Bulletin of Environmental Contamination and Toxicology 21(1/2):79-84.

Analytical techniques, Wastewaters, Contamination, Monitoring, Refining, *Enzyme inhibition screening

A procedure is described for determining the extent of enzyme inhibition by a simulated petroleum effluent which contained "conventional contaminants." The procedure was developed in response to a need for a rapid and inexpensive method for screening petroleum effluents. "Results suggest that enzyme inhibition may be a viable screening tool for refinery effluents."

79C-0736
A SURVEY OF PETROLEUM HYDROCARBON CONCENTRATIONS IN THE SHELF REGIONS AND ADJACENT WATERS OF THE WEST COAST OF INDIA
Sen Gupta, R., S.P. Fondekar, and R.S. Topgi. 1978.
Indian Journal of Marine Science 7(1):12-14.

Sampling, Concentrations, Hydrocarbons, Coastal waters, Offshore, India

"Petroleum hydrocarbons of the uppermost 10 m of the Arabian Sea, ≤160 nautical miles from the coast, were detected by UV spectrophotometry. Their concentrations were 0.12-2.44 mg/L (average 1.14 mg/L). The concentrations were higher (average 1.5 mg/L) in the region north of 15° N latitude than to the south (average 0.8 mg/L), indicating a greater degree of oil pollution in this region."

[from Chemical Abstracts 89(16):#131930p. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0737
A ROUND BOTTOMED FLASK SAMPLER FOR CONTAMINATION-FREE SUBSURFACE SEA WATER SAMPLING FOR THE ANALYSIS OF HYDROCARBONS AND CHLORINATED HYDROCARBONS [English summary]
Stadler, D., and K. Schomaker. 1977.
Deutsche Hydrographische Zeitschrift, Vol. 30:20-25.

Sampling, Hydrocarbons, Seawater, Design-engineering, Equipment

A spherical glass sampling device for hydrocarbon analysis is described. The sample is extracted within the sampler by shaking with a suitable solvent. The extract is separated by a special device, and the sampler is again ready for sampling.

[from Marine Pollution Research Titles 4(8):#1435. 1977]

79C-0738
MASS FRAGMENTGRAPHIC DETERMINATION OF DIISOPROPYL NAPHTHALENE AND PHENYL XYLYLETHENE, AND THE ENVIRONMENTAL CONTAMINATION FROM THEM
Sumino, K. 1977.
Archives of Environmental Contamination and Toxicology 6(2-3):365-369.

Analytical techniques, Hydrocarbons, *Mass fragmentgraphy

An analytical method with high sensitivity was developed using mass fragmentgraphy for the microdetermination of hydrocarbons. Data for fish, soil, and water from two bays and a river in Japan show the degree of pollution by the title contaminants. [possibly oil pollution related]

[from Environmental Abstracts 8(3):#78-01636. 1978]

79C-0739
OIL CHARACTERIZATION BY MULTICOMPONENT FLUORESCENCE ANALYSIS
Warner, I.M., J.B. Callis, E.R. Davidson, and G.D. Christian. 1977.
Genesis of Petroleum and Microbiological Means for Its Recovery [Papers presented at the Microbiology Group Symposium, 1976]. London, Institute of Petroleum, 1977. p. 129-135.

Oil spills, Analytical techniques, Source identification, *Multicomponent fluorescence

"Algorithms using an emission-excitation matrix are presented for the processing of multicomponent fluorescence data, to achieve an efficient dimensionality reduction for input to pattern recognition programs for the identification of oil spills."

[from Chemical Abstracts 89(16):#131907m. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0740
FATE AND EFFECTS OF OIL DISCHARGED ON THE MARINE ENVIRONMENT
Wasik, S., F.P. Schwarz, R.N. Boyd, R.L. Brown, et al. 1978.
Air and Water Pollution, Annual Report FY 74-76. W.H. Kirchoff and E. Myers. US Department of Commerce, National Bureau of Standards, 1978. NBS Technical Note No. 963. p. 328-331.

Hydrocarbons, Aromatic hydrocarbons, Petroleum products, Sampling, Chemical analysis, Solubility, *Partition coefficients

Objectives of the title study were the following: 1) To measure the partitioning of petroleum products in the marine environment; 2) to develop methods for sampling and analyzing hydrocarbons in the aquatic environment; 3) to evaluate the sensitivity and selectivity of spectrofluorometry for measuring aromatic hydrocarbons in water and to elucidate the physical and chemical properties of aromatic hydrocarbons in aqueous systems. Three methods for determining the solubilities and partition coefficients of hydrocarbons in fresh and sea water are described.

[from Petroleum Abstracts 19(9):#260,088. 1979]

79C-0741
QUALITATIVE AND QUANTITATIVE DETERMINATION OF OIL IN WATER AND SEDIMENTS [in English]
Wennergren, G. 1978.
Institutet foer Vatten-och Luftvardsforskning, Publication B 434. 17 p.

Chemical analysis, Concentrations, Sediments, Freshwater, Seawater

"A review with eight references is presented."

[from Chemical Abstracts 89(14):#117325p. 1978]

79C-0742
METHODS FOR POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS IN THE MARINE ENVIRONMENT
Wise, S.A., S.N. Chesler, H.S. Hertz, L.R. Hilpert, and W.E. May. 1978.
Carcinogenesis - A Comprehensive Survey, Vol. 3 (Polynuclear Aromatic Hydrocarbons):175-182.

Chemical analysis, Chromatography, Spectrometry, PAH, Natural seepage, Sediments, Seawater, *Headspace sampling

"Headspace sampling, liquid chromatography and fluorescence spectrometry are used to detect polynuclear aromatic hydrocarbons in oil seep sediments and seawater."

[from Chemical Abstracts 89(18):#152407p. 1978]

79C-0743
RAPID QUALITATIVE PROCEDURE FOR THE IDENTIFICATION OF PETROLEUM PRODUCTS IN ANIMAL TISSUE BY GAS-LIQUID CHROMATOGRAPHY
Zinn, L.L. and W.C. Edwards. 1979.
Bulletin of Environmental Contamination and Toxicology 22(1/2):285-286.

Analytical techniques, Hydrocarbons, Detection, Petroleum products, Chromatography, Animals, *Ruminants

The title article describes briefly the rapid and extremely accurate analytical procedure developed for investigation of suspected petroleum intoxication of ruminants, specifically of petroleum hydrocarbons in intestinal contents and tissues.

79C-0744
THE INTERFERENCE OF AROMATIC HYDROCARBONS IN THE DETERMINATION OF PCB'S
Zitko, V. 1978.
Joint Conference on the Sensing of Environmental Pollutants, 4th, New Orleans, 6-11 November 1977. Washington, DC, American Chemical Society, 1978. p. 757-760.

Analytical techniques, Aromatic hydrocarbons, Chromatography

The title article describes the manner in which the fluoroanthene and pyrene present in high concentrations in some marine organisms give an erroneously high indication of PCB levels when using routine GC analysis. The two aromatics can be separated from PCBs by column chromatography on silica. [possibly oil pollution related]

4. Source Identification

79C-0745
OIL SPILL IDENTIFICATION
Bentz, A.P. 1977.
Petrolieri International 24(2):51-64.

Source identification, Chemical analysis, Weathering, Law enforcement, EPA

Provisions of the 1972 Federal Water Pollution Control Act amendments require that law enforcement agencies, including EPA, develop fingerprinting methods for oil identification. Chemical analysis and characterization of oils and changes caused by weathering are discussed.

[from Petroleum Abstracts 19(12):#260,919. 1979]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0746

NATURAL BACKGROUND OF ALKANES IN THE AQUATIC ENVIRONMENT

Brassell, S.C., G. Ellington, J.R. Maxwell, and R.P. Philip. 1978.
Aquatic Pollutants: Transformation and Biological Effects. Proceedings of the Second International Symposium on Aquatic Pollutants, Amsterdam, 26-28 September 1977. O. Hutzinger, L.H. Van Lelyveld, and B.C.J. Zoeteman (eds.). Oxford, Pergamon Press, 1978. p. 69-86.

Source identification, Hydrocarbons, Biogenic hydrocarbons, Distribution, Chemical analysis, *Alkanes

The sources of biogenic and pollutant hydrocarbon input to the aquatic environment are discussed with emphasis on the alkanes. Environmental processes affecting alkane distribution patterns are considered and an examination is made of some problems and methods involved in distinguishing between alkanes of natural and pollutant (such as a crude oil spill) origin.

79C-0747

COMPUTER TECHNIQUES FOR IDENTIFYING OIL SPILLS

Chien, Y.T. 1977.
Report W-78-03963, OWRT-A-060-CONN(1), Contract D1-14-31-0001-6007. 21 p.
Completion report July 75 - September 77.

Source identification, Analytical techniques, Oil spills, Models, Information systems, *Pattern recognition

The use of pattern recognition methods applied to oil spill identification problems was investigated. Two systems were developed. One is an interactive system capable of manipulating discrete waveforms (infrared or fluorescent spectra), and the other is a general two-dimensional pictorial information processor.

[from Government Reports Announcements 78(11):126. #PB-277 487. 1978]

79C-0748

SOURCE ASSESSMENT: RAIL TANK CAR, TANK TRUCK, AND DRUM CLEANING, STATE-OF-THE-ART

Earley, D.E., K.M. Tackett, and T.R. Blackwood. 1977.
Report MRC-DA-713, EPA-600/2-78-004G, Contract EPA-68-02-1874. 69 p.
Final report.

Source identification, Equipment, Oil transfer, Pollution prevention

This document reviews the state of the art of air emissions and water pollutants from cleaning rail tank cars, tank trucks, and drums. Composition, quantity and rate of emissions and pollutants are described.

[from Government Reports Announcements 78(17):237. #PB-280 726. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0749
OIL IDENTIFICATION: RECENT DEVELOPMENTS IN FLUORESCENCE AND LOW TEMPERATURE LUMINESCENCE
Eastwood, D., et al. 1978.
American Laboratory 10(3):45-52.

Source identification, Analytical techniques, Weathering, USCG, *Luminescence

Research on molecular emission methods is described, and evaluations on newly developed and prototype instrumentation are discussed. These methods are under consideration as supplemental techniques to the USCG's multi-method analytical approach for oil spill identification. The aim is to develop methods that increase and enhance spectral structure provided that the structure obtained is relatively stable with weathering.

[from Environmental Abstracts 8(7/8):#78-03926. 1978]

79C-0750
CONTOUR LUMINESCENCE SPECTRA AND THEIR INTERPRETATION
Hornig, A.W. 1977.
Proceedings, Workshop on Pattern Recognition Applied to Oil Identification, Coronado, California, 1976. Piscataway, New Jersey, Institute of Electronics and Electrical Engineers, 1977. p. 136-150.

Source identification, Analytical techniques, *Luminescence

The use of a computerized total-luminescence technique for oil identification is discussed. An unknown oil is identified by comparing its emission spectra with model spectra stored previously in computer memory.

[from Chemical Abstracts 89(14):#113462h. 1978]

79C-0751
VISUAL AND CHEMICAL EVIDENCE FOR A NATURAL SEEP AT SCOTT INLET, BAFFIN ISLAND, DISTRICT OF FRANKLIN [Eastern Arctic]
Levy, E.M. 1978.
Geological Survey of Canada, Paper 78-1B:21-26.

Source identification, Chemical analysis, Natural seepage, Oil slicks, Arctic, Canada

"A hydrochemical survey of the area indicates that the source of a slick is natural seepage of petroleum from the seabed."

[from Chemical Abstracts 89(14):#113480n. 1978]

A. OIL POLLUTION DETECTION AND EVALUATION

79C-0752
METHODS FOR IDENTIFYING THE SOURCE OF SPILLED OIL
Sleeter, T. 1978.
Harvard Environmental Law Review, Vol. 2:514-522.

Source identification, Chemical analysis, Liability, Law enforcement

Fingerprinting techniques could provide decision-makers with a valuable enforcement tool for controlling oil pollution from vessel operations. Analysis of oil samples is done by separation techniques, by spectrographic techniques, or by a combination of the two. Because the techniques have achieved accuracies greater than 99%, they have gained acceptance by many people involved in spill identification; but it remains unclear whether the courts will accept the evidence from these techniques as sufficient to establish liability.

79C-0753
FIELD INFRARED METHOD TO DISCRIMINATE NATURAL SEEPS FROM NON-SEEPS (SANTA BARBARA, CALIFORNIA AREA). FINAL REPORT
US Coast Guard. 1976.
Report CGR/DC-15/76. 25 p.

Source identification, Spectroscopy, Chemical analysis, Natural seepage, Weathering, Santa Barbara Channel, *IR

A field infrared method is described for distinguishing natural seep oil in the Santa Barbara Channel from similar oils derived from oil spills.

[from Petroleum Abstracts 19(12):#260,917. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

1. Containment

79C-0754
CONTAINING OIL SPILLS WITH BUBBLES
Anon. 1978.
Engineering 281(6):576-577.

Spill containment, Equipment, Design-engineering, *Pneumatic barrier

As a result of work at Atlas Copco, it is now possible to design bubble barriers that can contain oil layers several decimeters thick. The principles of operation are described and the advantages are discussed.

[from Petroleum Abstracts 19(1):#258,002. 1979]

79C-0755
THE FEASIBILITY OF PNEUMATIC AND WATER SPRAY BARRIERS AS FIREPROOF OIL SLICK CONTAINMENT DEVICES
Comfort, G., B. Menon, and W. Purves. 1979.
Spill Technology Newsletter 4(2):93-110.

Spill containment, Booms, Design-engineering, Equipment, Performance testing, *Pneumatic barrier

The title devices were evaluated in response to the need to develop new technology for the retention and concentration of a floating slick during in situ burning. The water spray barrier is concluded to be clearly superior to the pneumatic air bubbler in terms of its ability to retain an oil slick. Construction and field testing of a prototype water spray barrier is urged.

79C-0756
FLOATING BARRIER WITH VARIABLE GEOMETRY
Julian, Y. 1978.
French Patent 2,378,904

Spill containment, Booms, Design-engineering, Patent

Retaining panels with floats and a mobile skirt are connected to a series of supports which rest on the bottom and cause the barrier to maintain a vertical position even at low tide. The supports are ballasted at their lower ends. The system can be maintained in place by means of fixed or mobile mooring points.

[from Petroleum Abstracts 19(17):#262,264. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0757
FLOATING BARRIER AGAINST OIL, COLLISIONS, AND WAVE ACTION
Mitsubishi Jukogyo KK. 1977.
Netherlands Patent Application 7,712,981

Spill containment, Booms, Equipment, Design-engineering, Patent

The barrier has means to catch and contain oil floating on water. It may also serve to lessen the impact of ship collisions and to absorb wave action.

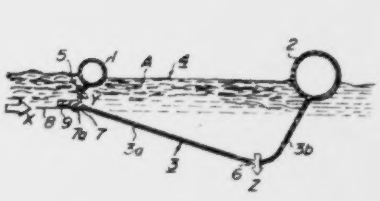
[from Petroleum Abstracts 19(23):#263,852. 1979]

79C-0758
OIL BOOM FOR DAMMING AND COLLECTING A FLOATING OIL SLICK
Muramatsu, T., T. Fukai, and H. Takahashi. 1978.
US Patent 4,096,700

Spill containment, Booms, Equipment, Design-engineering, Oil-water separation, Patent

The barrier has two rows of upper and lower stream side floats to which a base sheet which hangs into the water is connected. Inlet and outlet openings in the base sheet are arranged such that oil is not only contained, but is separated from the water.

4,096,700
OIL BOOM FOR DAMMING AND COLLECTING A FLOATING OIL SLICK
Tateo Muramatsu; Toshio Fukai, both of Yokohama, and Haruo Takahashi, Kawasaki, all of Japan, assignors to Bridgestone Tire Co., Ltd., Tokyo, Japan
Filed Nov. 4, 1976, Ser. No. 738,977
Claims priority, application Japan, Nov. 12, 1975, 50-152877; Feb. 20, 1976, 51-18251
Int. Cl.^{2} E02B *15/04*
U.S. Cl. 61—1 F **15 Claims**



79C-0759
BARRIER CONSTRUCTION FOR WATER CARRIED POLLUTANTS
Preus, P. 1979.
Canadian Patent 1,048,799

Spill containment, Booms, Design-engineering, Patent

The barrier consists of a series of end-to-end connected boom sections, each comprising a hollow tubular sleeve containing a floatable material. A cable extends through each sleeve and connects the eyes of adjacent boom sections. End covers for the ends of the tubular sleeves are provided.

[from Petroleum Abstracts 19(22):#263,637. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0760
FLOATING BARRIER INTENDED TO BE INSTALLED ON AN EXPANSE OF WATER IN ORDER TO SURROUND A POLLUTED ZONE
Resinex, SpA. 1978.
French Patent 2,372,933

Spill containment, Booms, Design-engineering, Patent

The barrier consists of an external tubular container impervious to water with closed ends and several floating bodies of smaller diameter which support the cylinder so its upper edge rises above the water level.

[from Petroleum Abstracts 19(18):#262,503. 1979]

2. Cleanup and Removal

79C-0761
DREDGE/CLEANUP VESSEL DESIGNED [news brief]
Anon. 1979.
World Dredging and Marine Construction 15(4):26.

Spill cleanup, Spill removal, Skimmers, Ships, Oil-water separation, Design-engineering

A combination dredge/oil spill cleanup vessel is being developed by IHC Holland. While primarily a maintenance dredge, the vessel will be on 24-hour alert for oil spills and will be equipped with onboard skimmers, oil-water separators, and a holding capacity of 5000 m^3 (one million gallons) of recovered oil.

79C-0762
DREDGE/OIL SKIMMER LAUNCHED IN TOKYO [news brief]
Anon. 1978.
World Dredging and Marine Construction 14(9):52.

Spill cleanup, Skimmers, Ships, Equipment, Design-engineering, Product information

Mitsubishi Heavy Industries Ltd. of Tokyo has announced the completion of the Seriyu Maru, a vessel built for dredging and oil skimming. As a skimmer, the vessel is equipped with a vortex type collector and a newly developed fixed tilt plate-type collector. Oil can be collected in up to 2.5 m waves and has a holding capacity of up to 1,450 m^3 of collected oil and water.

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0763
INTERNATIONAL REPORT: CONTAINING OIL SPILLS IN THE NORTH SEA
Anon. 1979.
Ocean Industry 14(4):258, 260, 265.

Spill cleanup, Spill containment, Equipment, Ekofisk blowout, North Sea

Methods of spill containment and cleanup used in the North Sea during the Ekofisk blowout are described.

[from Petroleum Abstracts 19(24):#264,153. 1979]

79C-0764
NEW OIL DISPERSANT [news brief]
Anon. 1979.
Marine Pollution Bulletin 10(1):35-36.

Dispersants, Biodegradation, Spill cleanup, Ships, Performance testing, Pollution control, New York, *Corexit 9527

Application of Exxon's chemical dispersant, Corexit 9527, is "claimed to have successfully dealt with" a spill from a barge which sank off Breezy Point, Queens, New York. The chemical "causes the oil to biodegrade more readily and prevents the oil from adhering to surfaces such as sand."

79C-0765
NEW OIL RECOVERY VESSEL DEEMED VERSATILE [news brief]
Anon. 1979.
World Dredging and Marine Construction 15(2):19.

Spill cleanup, Oil removal, Skimmers, Ships, Tankers, Equipment, Design-engineering, Product information

The C. Luring Shipyard of Brake, West Germany, is developing a combination oil recovery vessel/coastal tanker. "A series of tests on models of the twin-hull multipurpose ship, working as an oil recovery vessel, went beyond all expectations." During oil removal operations, the twin hulls split apart at the bow, and remain hinged at the stern, thereby forming an oil recovery opening 80 m wide. The vessel advances into the slick and recovers oil with attached skimmers and can hold about 5,000 m^3 of oil in its storage tanks.

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0766
POLLUTION BY HYDROCARBONS: A COMPLETE INTERVENTION SYSTEM [in French]
Anon. 1977.
Petrolieri International 24(4):24-25.

Spill cleanup, Spill removal, Equipment, Design-engineering, France

A French company has devised a system for combatting oil spills using four different technologies. Floating barriers are used for spill containment; recovery is achieved by Vortex-type separators. A mobile Cyclonet system recovers oil escaping from the system. Oil is collected in flexible tanks and towed to the coast.

[from Petroleum Abstracts 19(12):#260,921. 1979]

79C-0767
SKIMMED ALIVE
Anon. 1978.
Offshore Services 11(5):32.

Spill removal, Skimmers, Equipment, Amoco Cadiz spill

Storm conditions prevailed when most of the oil was released from the Amoco Cadiz. Two ships equipped with Cyclonet skimmers were able to carry out skimming operations during a calm spell. Skimmed oil was pumped into flexible tanks towed behind the ship. As the weather worsened, the tanks did not function properly. It is important that no time is lost in trying to halt the progress of a slick towards other parts of the coast.

[from Petroleum Abstracts 19(4):#258,390. 1979]

79C-0768
FRANCE-DUNKERQUE IN ASSAULT AGAINST THE BLACK TIDE [in French]
Author unknown. 1978.
Industrie du Petrole en Europe, Gaz-Chimie 46(497):79-81.

Ships, Spill cleanup, Pollution control, Oceans, Design-engineering, France

The France-Dunkerque shipyards have presented a plan for a ship specialized for controlling and treating oil pollution at sea. The ship is intended mainly for separating spilled oil and water, pumping the filtered water back into the sea, and storing the separated oil. It will accommodate a crew of 50 and have diving facilities, pumping means, and a helicopter landing pad. Two tugs for deploying a containment barrier will be associated with the ship. Construction time is estimated at 20 months.

[from Petroleum Abstracts 19(23):#263,854. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0769
AN AGENT FOR REMOVING PETROLEUM AND PETROLEUM PRODUCTS FROM THE WATER SURFACE
Abaeva, T.V., N.M. Antonova, Yu. Kh. Lukmanov, O.S. Mochalova, et al. 1978.
USSR Patent 602,214

Dispersants, Surfactants, Spill cleanup, Sea surface, Patent

The agent contains water and, as the surfactant, an acidic salt of phosphoric ether and an oxyethylized higher order alcohol. It also contains a water-soluble polymer.

[from Petroleum Abstracts 19(13):#261,205. 1979]

79C-0770
CASE STUDY: OIL RECOVERY BENEATH ICE
Allen, A.A. 1978.
Offshore Technology Conference, 10th, Houston, Texas, 8-10 May 1978. Vol. 1:261-267.

Spill removal, Spill cleanup, Sorbents, Cold climates, Ice, Oil tanks, Alaska

Methods used to recover oil spilled from an onshore storage tank in Nome, Alaska, are detailed. Some 23,000 L (6,000 gal) were spilled, of which 7,600 L (2,000 gal) of oil were recovered during a one-week period of temperatures approaching -30° F. Containment and recovery operations included removal of snow, soil, and ice; sorption of oil with snow and with sorbent materials; and the collection of oil from beneath the river's 1 m thick ice cover using an oil rope mop and wringer.

[from Environment Abstracts 9(2):#79-01376. 1979]

79C-0771
APPARATUS FOR THE RECOVERY OF OIL SPILLED AT SEA, TRANSFORMABLE INTO A TOWED TANK
Amanjean, P. 1978.
French Patent 2,373,643

Spill cleanup, Spill removal, Equipment, Design-engineering, Patent

The apparatus consists of two vessels towing a large barrier, the apex of which has a bag for collecting the oil.

[from Petroleum Abstracts 19(18):#262,507. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0772
OIL CLEAN-UP APPARATUS
Bartos, J.J. 1978.
Canadian Patent 1,042,818

Spill cleanup, Ships, Booms, Equipment, Design-engineering, Patent

This vessel-mounted apparatus consists of an on-board storage tank and and extended boom with rotating augers. The augers propel the oil into a collection pocket near the end of the boom which contains a sump box to receive the oil. A pumping mechanism transfers the oil collected in the sump to the on-board storage tank.

[from Petroleum Abstracts 19(14):#261,494. 1979]

79C-0773
APPARATUS FOR COLLECTING SHEETS OF PRODUCTS FLOATING ON A LIQUID SURFACE
Baumard, U. 1978.
French Patent 2,378,905

Spill removal, Design-engineering, Patent

A tank with an opening on top is surrounded by an endless flexible belt driven by means of a sheave and countersheave. The belt descends into the water, collects the pollutant, and ascends through a chimney where it is mechanically stripped of the pollutant above the tank opening.

[from Petroleum Abstracts 19(17):#262,278. 1979]

79C-0774
PERFORMANCE TESTING OF OIL MOP ZERO RELATIVE VELOCITY OIL SKIMMER
Breslin, M.K. 1978.
Report EPA/600/7-78/060, Contract EPA-68-03-0490. 30 p. Final report.

Spill cleanup, Skimmers, Equipment, Design-engineering, Performance testing, *OHMSETT

Designed for use in a fast current, this device adsorbs oil onto oleophilic fibers woven into a rope. The rope and fibers are then squeezed to remove the oil into a recovery basin. Only a few tests were run on the device at the OHMSETT test facility due to weather problems and difficulties with the device. Results are presented.

[from Government Reports Announcements 78(16):262. #PB-280 232. 1978]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0775
METHOD AND APPARATUS FOR THE RECOVERY OF PRODUCTS WHICH ARE DIFFICULT TO PUMP
Cessou, M. 1978.
French Patent 2,380,968

Oil removal, Tankers, Design-engineering, Patent, *Pumping

This addition to French Patent Application 37,849 facilitates the rise of the products mixed with reheated water under pressure by additional injection of liquid or gas at one or several secondary points. "This invention is particularly applicable to the recovery of hydrocarbons which are difficult to pump and which are located in shipwrecked or sunk tankers."

[from Petroleum Abstracts 19(17):#262,277. 1979]

79C-0776
NOVEL METHOD FOR THE RECOVERY OF PRODUCTS WHICH ARE DIFFICULT TO PUMP AND APPARATUS FOR ITS APPLICATION
Cessou, M. 1978.
French Patent 2,373,471

Oil removal, Tankers, Equipment, Design-engineering, Patent

The viscosity of the product is reduced by subjecting it to the mechanical action of jets of water or solvent.

[from Petroleum Abstracts 19(18):#262,506. 1979]

79C-0777
PROCESS AND APPARATUS FOR THE RECOVERY OF PRODUCTS DIFFICULT TO BE PUMPED
Cessou, M. 1978.
French Patent 2,373,470

Oil removal, Tankers, Design-engineering, Patent, *Pumping

The product is subjected simultaneously to heat and mechanical agitation. The invention is applicable to the recovery of hydrocarbons from shipwrecked or sunk tankers.

[from Petroleum Abstracts 19(18):#262,505. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0778
APPARATUS AND METHOD FOR REMOVING FLOATING OIL FROM THE SURFACE OF OIL-POLLUTED WATER
Davies, D.H. 1978.
British Patent 1,530,342

Spill cleanup, Skimmers, Equipment, Design-engineering, Patent

A craft floating on water has an opening through which surface water and oil can enter a compartment over a float-controlled hinge or articulated flap. Water separated from oil is ejected from the compartment by means of pumps.

[from Petroleum Abstracts 19(22):#236,640. 1979]

79C-0779
BEHAVIOR OF THE BOUCHARD #65 OIL SPILL IN THE ICE-COVERED WATERS OF BUZZARDS BAY
Deslauriers, P.C., and S. Martin. 1978.
Offshore Technology Conference, 10th, Houston, Texas, 8-10 May 1978. Vol. 1:267-277.

Spill cleanup, Ice, Spill removal, Spreading, Weathering, Bouchard 65 spill, Buzzards Bay

About 307,000 L (81,150 gal) of No. 2 heating oil spilled into Buzzards Bay, Mass., after the oil barge Bouchard #65 grounded on 28 January 1977. Cleanup efforts were hampered by moving ice, strong currents, and snow. The most successful oil recovery technique was direct suction from pools into vacuum trucks; 49,000 L (13,000 gal) of oil were recovered by this method. Weathering, spreading, migration, adsorption, and transport of the oil under moving ice conditions are described.

[from Environment Abstracts 9(2):#79-01044. 1979]

79C-0780
AMPHIBIOUS OIL SPILL CLEANER [news brief]
Dixon, T.R. 1979.
Marine Pollution Bulletin 10(3):68.

Spill cleanup, Equipment, Design-engineering, UK, Performance testing, Product information, *Invictacat

The eight-wheeled amphibious vehicle "Invictacat" is briefly described including dispersant application capabilities and power plant. Maneuverability, limited amphibious capability, and cross-country performance are given. The vehicle is to be used in future Kent County, England,oil spill cleanup operations.

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0781

ROLE OF ADSORBENTS IN THE REMOVAL OF SOLUBLE AROMATIC HYDROCARBONS FROM DRINKING WATER

El-Dib, M.A., A.S. Moursy, and M.I. Badaway. 1978.
Water Research 12(12):1131-1137.

Oil-water separation, Adsorption, Sorbents, Aromatic hydrocarbons

The effectiveness of bentonite, kaolinite, and powdered activated carbon in removing aromatic hydrocarbons from drinking water was investigated. The suspended clay minerals of bentonite and kaolinite showed low adsorption; the powdered activated carbon adsorbed well and should be considered for large-scale removal of aromatic hydrocarbons from drinking water.

[from Environment Abstracts 9(3):#79-01873. 1979]

79C-0782

EVALUATION OF PUMPS AND SEPARATORS FOR ARCTIC OIL SPILL CLEANUP

Environmental Protection Service, Canada. 1979.
Canada Environmental Protection Service, Environmental Impact Control Directorate, Report EPS4-EC-79-3. __ p.

Spill cleanup, Equipment, Performance testing, Oil-water separation, Arctic

Commercially available positive displacement pumps were evaluated for use in handling oil, water, and ice mixtures during spill cleanup operations under arctic conditions. The pumps were assessed on the basis of weight, capacity, debris tolerance, self priming capability, and ability to operate in sub-freezing temperatures. None of the commercially available oil separators were considered adequate under similar operating conditions. An API design separator functioned satisfactorily under simulated cold conditions.

[from Spill Technology Newsletter 4(2):52-53. 1979]

79C-0783

TESTING OF AIR-DEPLOYABLE INCENDIARY DEVICES FOR IGNITING OIL ON WATER

Environmental Protection Service, Canada. 1979.
Canada Environmental Protection Service, Environmental Impact Control Directorate, Report EPS 4-EC-79-3. __ p.

Spill removal, Crude oil, Burning, Oil slicks, Performance testing, Equipment, *Incendiary devices

Field experiments were conducted in 1977-1978, in which several different igniters were tested for their ability to ignite crude oil slicks. Performances of the igniters were compared under static and air deployment situations, and necessary modifications were made to each igniter design.

B. OIL POLLUTION PREVENTION AND CONTROL

Static tests suggest that fresh crude oil slicks over 1 mm thick are easily ignited; ignition of weathered slicks over 3 mm thick is possible but difficult. Air deployment tests were most successful when safety fuses were combined with solid fuel igniters.

[from Spill Technology Newsletter 4(2):53. 1979]

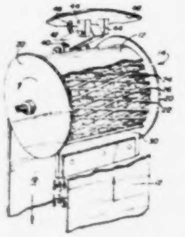
79C-0784
BELT TYPE OIL REMOVAL UNIT
Ettelt, G.A., and A.L. Cohen. 1978.
US Patent 4,089,784

Spill removal, Equipment, Design-engineering, Patent

A system for removing oil from a basin comprises an endless belt driven and partially submerged in the basin and supported by a rotary drum with an irregular surface. The oil is scraped and directed away from the belt and basin. Means are provided for wiping the underside of the drum surface.

[from Petroleum Abstracts 19(5):#258,853. 1979]

4,089,784
BELT TYPE OIL REMOVAL UNIT
Gregory A. Ettelt, Berwyn, and Alfred L. Cohen, Deerfield, both of Ill., assignors to Tenco Hydro/Aerosciences, Inc., Countryside, Ill.
Filed Mar. 29, 1976, Ser. No. 671,383
Int. Cl.^{2} B01D *17/00*
U.S. Cl. 210—526 2 Claims



79C-0785
OIL PICK UP DEVICE
Finigan, A. 1978.
British Patent 1,523,590

Spill removal, Skimmers, Equipment, Design-engineering, Patent

Disks are mounted on separate axles which are mounted on bearings positioned on different radii of a circle. The axles are connected by universal joints to form linked drive chains. When the disks are rotated, adhering liquid is removed by scrapers. The drive chain may be driven by a hydraulic or pneumatic motor. Liquid removed from the disks is fed into a collecting sump.

[from Petroleum Abstracts 19(5):#258,857. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0786
DOMESTIC DISPERSING AGENT FOR CLEANING OF THE SEA WATER [in Serbo-Croatian]
Fles, D., and M. Sateva. 1978.
Nafta (Yugoslavia) 29(6):326-329.

Spill cleanup, Dispersants, Toxicity, Biodegradation

"Based on domestic ingredients which originate from the byproducts of the petrochemical industry, a dispersing agent with good oil dispersing properties was prepared in a laboratory. Preliminary tests of biodegradability and toxicity to marine life have shown satisfactory results."

[from Petroleum Abstracts 19(4):#258,394. 1979]

79C-0787
REMOVAL OF OIL SLICKS FROM WATER
Henning, F. 1978.
German Offenlegungsschriften (patent application) 2,704,917

Oil slicks, Spill cleanup, Surfactants, Sinking agent, Patent

CaO is mixed in a flow-through tank with surfactant containing water, and the solution is sprayed onto oil slicks. The oil-laden $Ca(OH)_2$ sinks under its gravity to the sea bottom. Means to increase the floating time of $Ca(OH)_2$ are described.

[from Chemical Abstracts 89(18):#152543e. 1978]

79C-0788
GELLING OF SPILLED OILS
Homma, M., and K. Honda. 1978.
Japanese Kokai (patent application) 78 30,476

Spill cleanup, Patent, *Gelling agent

A gelling agent containing an N-acyl amino acid amide or ester is sprayed on spilled oil, then water is sprayed onto the oil, causing the oil to gell within a few minutes.

[from Chemical Abstracts 89(18):#149358t. 1978]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0789
METHOD AND APPARATUS FOR THE REMOVAL OF POLLUTANTS
Jacobs, W.E. 1978.
British Patent 1,504,300

Spill cleanup, Contamination, Land spills, Waste oil treatment, Patent

"Oil spills on bodies of water and dry land and oil contamination on animals, skin, and tanks can be removed by contacting the surface with powdered polyethylene." A dough-like mass is formed which is easily removed from the surface and can be disposed of by combustion or by treatment to reclaim the oil adsorbed by the polyethylene.

[from Chemical Abstracts 89(16):#130610x. 1978]

79C-0790
USING SELECTED COALS TO REMOVE POLLUTANTS FROM SURFACE WATERS AND SEDIMENTS SETTLED THEREFROM
Jones, C.T. 1978.
Canadian Patent 1,034,686

Oil removal, Sediments, Pollution control, Biological treatment, Oxidation, Patent

Polluted sediments are treated as follows: 1) Raw sediments are mixed with powdered adsorptive coal; 2) the mixture is stored and the liquids removed as leachates from the solids; 3) the leachate is passed into a biological oxidation bed; 4) the leachate is filtered to remove remaining coal fines or pollutants. [possibly oil pollution related]

[from Petroleum Abstracts 19(6):#259,197. 1979]

79C-0791
MOPPING UP THE OIL
Lock, J. 1978.
Processing 24(6):31.

Spill removal, Equipment, Design-engineering, _Amoco Cadiz_ spill, *Oil mop

The operation of an oil mop used in the cleanup of the _Amoco Cadiz_ spill is described.

[from Petroleum Abstracts 19(5):#258,854. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0792
WEATHERING OF SPILLED OIL AND METHODS OF ACCELERATING
McAuliffe, C.D. 1977.
Oceans '77 Conference, 3rd Annual Combined Conference, Los Angeles, 17-19 October 1977. Marine Technology Society and Institute of Electrical and Electronics Engineers, 1977. p. 40D-1-40D-10. Conference Record, Vol. II.

Spill removal, Weathering, Environmental effects, Dispersants, Biodegradation

The title paper generally discusses the weathering of oil spills and the various processes a spreading slick goes through including degradation, uptake by organisms, evaporation, and impacts on plants and animals. He concludes by presenting a case for the use of dispersants for the purposes of accelerating weathering and biodegradation and lessening adhesion.

79C-0793
PERFORMANCE TESTING OF SELECTED INLAND OIL SPILL CONTROL EQUIPMENT
McCracken, W.E. 1977.
Report MHSM/LNJ-01, EPA/600/2-77/150, Contract EPA-68-03-0490. 125 p. Final report.

Spill cleanup, Skimmers, Booms, Equipment, Performance testing, Design-engineering, *OHMSETT

Standardized performance test results are described for various off-the-shelf inland oil-spill control and cleanup devices. The tests were carried out at EPA's OHMSETT facility. No. 2 fuel oil and a lubrication oil were used in the tests which tested the boom systems in both the catenary (U) and diversionary (J) configurations.

[from Government Reports Announcements 78(13):238. #PB-279 078. 1978]

79C-0794
PERFORMANCE TESTING OF SPILL CONTROL DEVICES ON FLOATABLE HAZARDOUS MATERIALS
McCracken, W., and S.H. Schwartz. 1977.
Report EPA/600/2-77/222, Contract EPA-68-03-0490. 152 p. Final report, Sept.-Nov. 75.

Spill cleanup, Skimmers, Booms, Equipment, Design-engineering, Performance testing, *OHMSETT

Parameters for the testing of selected oil spill control equipment included recovery rates, recovery efficiency, and throughput efficiency. After tests were carried out, it was concluded that equipment performance was directly related to the physical properties of the hazardous material being tested. The conduct of the project is described and the results, conclusions, and recommendations are given. A 16 mm color sound narrative motion picture was produced to document study results.

[from Government Reports Announcements 78(9):180. #PB-276 581. 1978]

79C-0795
EFFECTS OF BURNING CRUDE OIL SPILLED INTO SIX HABITAT TYPES IN ALASKA
McKendrick, J.D., and W.W. Mitchell. 1978.
Arctic 31(3):277-295.

Burning, Crude oil, Environmental effects, Plants, Soil, Recovery, Growth, Alaska

The effects of burning were examined at three sites representing five habitats. Burning during the summer growing season was more detrimental to plant survival than winter burning. Burning on frozen surfaces affected survival less than on thawed surfaces. Effects of soil temperature heating, oil aging, delayed burning, and effects on woody vegetation are discussed. Fires either burned rapidly and hot or were impossible to ignite.

79C-0796
APPARATUS FOR SKIMMING AND COLLECTING OIL AND OTHER POLLUTANTS FROM THE SURFACE OF WATER
National Marine Services, Inc. 1978.
French Patent 2,381,868

Spill cleanup, Skimmers, Design-engineering, Patent

A horizontal framework chassis supports collecting panels which float vertically and are adjusted in height individually so that the lower edge of the panels are below the oil layer. Guide surfaces create a current directed toward the skimming means from which the collected oil enters a tank. The apparatus is towed by a vessel.

[from Petroleum Abstracts 19(17):#262,271. 1979]

79C-0797
FLOATAGE CONCENTRATING EQUIPMENT FOR NAUTICAL FLOATAGE RECOVERY APPARATUS
Neal, R.W. 1978.
Canadian Patent 1,042,817

Oil removal, Ships, Equipment, Design-engineering, Patent

A number of sweeps move forward of a vessel on the water surface. Floatage is concentrated by 2 sweeps forward of the bow and is funnelled into a bow opening.

[from Petroleum Abstracts 19(14):#261,493. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0798
MARKETING FEASIBILITY OF USING CEDAR MILL WASTE FOR OIL SPILL CLEAN-UPS, CARIBOU, MAINE. 1978
Northern Maine Regional Planning Commission. 1978.
Report EDA-78-059, Grant EDA-01-6-01535. 60 p.

Spill removal, Absorption, Sorbents, Pollution control, *Cedar waste

A list of specifications was drafted without controlled laboratory testing including factors of density, absorption efficiency, and disposability. Compared with other absorbents used, the ratio of absorption is very high for the cedar residue tested.

[from Government Reports Announcements 78(14):215. #PB-279 476. 1978]

79C-0799
A FLOATING OIL STORAGE VESSEL FOR RECOVERING OIL SPILLS
Petroclearance Ltd. 1978.
British Patent 1,515,592

Spill cleanup, Skimmers, Ships, Oil-water separation, Equipment, Design-engineering, Patent

A vessel is described which is capable of lifting oil from the surface of seawater, separating the oil from the water, and temporarily storing the recovered oil for transfer to a larger vessel or storage facility.

[from Petroleum Abstracts 19(5):#258,856. 1979]

79C-0800
APPARATUS FOR REMOVING OILY SUBSTANCES FROM WATER
Ravagnan, G. 1978.
German Offenlegungsschriften (patent application) 2,757,041

Spill removal, Skimmers, Equipment, Design-engineering, Patent

Thick oils are removed from water by an apparatus which contains rotating wheels that dig into the water and mechanically scrape off the adhering oil, and a storage chamber for the recovered oil.

[from Chemical Abstracts 89(16):#135234n. 1978]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0801
ESSO BERNICIA INCIDENT, SHETLAND, DEC./JAN. [news brief]
Richardson, M.G. 1979.
Marine Bulletin 10(4): 97.

Oil spills, Spill cleanup, Environmental effects, Mortality, Animals, Birds, Scotland, *Esso Bernicia spill

Initial damages and cleanup operations resulting from the 30/31 December 1978 Esso Bernicia spill are outlined. Bird casualties were high, and otter and sheep mortalities have occurred. Problems associated with cleanup include inaccessibility of the coastline, the inability to effectively deal with heavy oil, extreme tide/current velocities, and wind changes.

79C-0802
INSTALLATION TO REMOVE OIL FROM A WATER SURFACE [in Dutch]
Shell International Res. Mij. BV. 1977.
Netherlands Patent Application 7,711,932

Spill cleanup, Skimmers, Equipment, Design-engineering, Patent

The oil catcher is towed next to a vessel but moves independently. Water and oil enter the open front end. Water is directed downward at the back of the collection chamber, and oil is accumulated in an oil-catch zone and removed from the chamber.

[from Petroleum Abstracts 19(5):#258,855. 1979]

79C-0803
ADSORBENT PROCESS FOR OILY MATERIALS
Zenno, A., T. Uebayashi, I. Muruyama, and S. Shiono. 1978.
US Patent 4,102,783

Spill cleanup, Emulsions, Adsorption, Sorbents, Patent

An adsorbent is composed mainly of unrefined lints or linters together with filter paper, synthetic fibers, or natural fibers.

[from Petroleum Abstracts 19(17):#262,279. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0804
API/SC-PCO SOUTHERN CALIFORNIA 1978 OIL SPILL TEST PROGRAM
Smith, D.D., and G.H. Holliday. 1979.
Spill Technology Newsletter 4(2):76-92.

Spill cleanup, Dispersants, Performance testing, Contingency planning, Chemical effects, Biological effects, California

The US continues to discourage the use of dispersants, whereas many other countries use low toxicity dispersants as a standard procedure in oil spill response. In 1978, the Southern California-Petroleum Contingency Organization and the API jointly organized and conducted dispersant field tests about 60 km off Southern California. This article reviews the aerial and vessel application of dispersants and summarizes preliminary results of the chemical and biological studies.

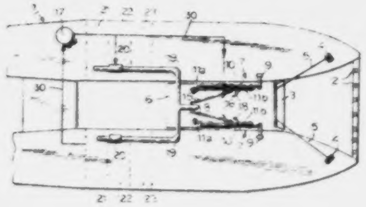
79C-0805
EFFLUENT OIL COLLECTING VESSEL
Uchida, S., H. Takeshita, and S. Tamazaki. 1978.
US Patent 4,100,072

Spill removal, Skimmers, Equipment, Design-engineering, Patent

Oil floating on a water surface is sucked through a suction means provided with a float secured by a linkage mechanism to an upper deck of the vessel.

[from Petroleum Abstracts 19(2):#258,004. 1979]

4,100,072
EFFLUENT OIL COLLECTING VESSEL
Shoji Uchida, Nagayo; Hiroshi Takeshita, and Shozo Yamazaki, both of Nagasaki, all of Japan, assignors to Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo, Japan
Filed Apr. 14, 1977, Ser. No. 787,453
Claims priority, application Japan, May 10, 1976, 51-58991
Int. Cl.² E02B *15/04*
U.S. Cl. 210—242 S **6 Claims**



79C-0806
TOWED PLANING SLED FOR DELIVERY OF OIL POLLUTION CONTROL EQUIPMENT, ADDENDUM I. IMPROVED VERSION OF TOWED PLANING SLED FOR OPERATION IN WET OR DRY MODE
Ward, R.S. 1977.
Report USCG D-7-77, Contract MIPR-Z-70099-4-42734. 30 p. Final report. (Addendum to report dated March 76, AD-A025 247.)

Pollution control, Equipment, Design-engineering, Spill cleanup, Performance testing, *Towed planing sled

B. OIL POLLUTION PREVENTION AND CONTROL

The title report describes modifications on a sled previously designed for fast surface delivery of equipment. Modifications provide a means to use the sled as a non-submerged or dry boat for transportation of non-floatable loads, or for use as a dry work platform.

[from Government Reports Announcements 78(10):196. #AD-A050 150. 1978]

3. Environmental Restoration

[no entries]

4. Personnel Training

79C-0807
BLOWOUTS: WHY SOME HAPPEN AND WHAT TO DO ABOUT IT
Anon. 1978.
World Oil 187(5):57-60, 66.

Personnel training, Blowout prevention

Human factors contributing to a blowout can include errors in judgement and fatigue. A quick reaction time may be required to control a well and prevent a blowout. Repeated practice of well control procedures presents a solution to the problem of rapid well control. The importance of proper management is stressed.

[from Petroleum Abstracts 19(10):#260,570. 1979]

79C-0808
TRAINING AS A FACTOR IN OIL SPILL RESPONSE
Alberts, D.A., et al. 1978.
Offshore Technology Conference, Houston, Texas, 8-10 May 1978. Vol. 1: 255-261.

Personnel training, Spill response, Contingency planning, Spill cleanup, Regulations, *Videotapes

B. OIL POLLUTION PREVENTION AND CONTROL

A videotape oil spill response training program, developed by Texaco Inc. and the NUS Corp., covers the topics: Governmental policies, oil spill, contingency planning, spill containment and removal, marine salvage, and firefighting.

[from Environment Abstracts 9(2):#79-00904. 1979]

5. Contingency Planning

79C-0809
COMPANIES FORM CO-OP TO COMBAT OIL SPILLS [news brief]
Anon. 1978.
Chemical Engineering 85(13):81.

Spill cooperatives, Oil industry, Spill response, Pollution prevention, Pollution control, Rivers, Delaware

"Twelve firms located on or near the Delaware and Skuylkill Rivers have formed a cooperative to contain any major oil spills that might occur in these two rivers. Firms in the group are Amoco, ARCO, BP, DuPont, Getty, Gulf, Interstate and Ocean Transport, Mantua Petroleum Terminals, Mobil, Philadelphia Electric, Sun, and Texaco."

79C-0810
OIL SPILLS: INDUSTRY FIGHTS BACK
Anon. 1978.
Marine Engineering Log 83(6):31-34.

Spill cooperatives, Spill response, Oil industry, Personnel training

US maritime, oil, and oil spill cleanup companies have formed more than 100 oil spill cooperatives whose purpose is quick reaction and to containment of marine oil spills. Oil spill cooperatives on the East Coast West Coast, and Gulf of Mexico are described. There are several training schools and programs dealing with the prevention, containment, and cleanup of oil spills.

[from Environment Abstracts 8(11):#78-06022. 1978]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0811
OIL SPILL TASK FORCES [news brief]
Anon. 1979.
Marine Pollution Bulletin 10(1):3.

Oil industry, Contingency planning, Spill cooperatives, Spill response

Exxon Oil Corporation is planning to form a number of specialist task forces to improve the corporation's capability to deal with major spills.

79C-0812
THE MEDITERRANEAN: THE BLUE PLAN
Antoine, S., et al. 1977.
Mazingira, No. 2:50-65.

Socioeconomic effects, Development, Environmental effects, Mediterranean Sea

The Blue Plan, a cooperative action taken by 18 Mediterranean nations, is concerned primarily with socioeconomic development of the region as a whole with minimal environmental impact. One issue omitted by the Plan is that of oil tanker traffic in the area.

[from Environment Abstracts 9(1):#79-00314. 1979]

79C-0813
OIL SPILLS: THE STRATEGY OF RECOVERY
Conrad, J.M. 1978.
Coastal Zone Management Journal 4(4):409-433.

Models, Offshore development, Coastal zone management, Georges Bank, Massachusetts

A model for determining the optimal location of recovery resources is developed and applied to coastal Massachusetts. Nine hypothetical situations were constructed relating to possible petroleum finds on Georges Bank and onshore developments in southeastern Massachusetts.

[from Environment Abstracts 9(3):#79-01787. 1979]

79C-0814
ACCIDENTS AT SEA CAUSING OIL POLLUTION. REVIEW OF CONTINGENCY MEASURES
Department of Trade, UK. 1978.
London, UK Department of Trade, 1978. __ p.

Contingency planning, Spill response, Dispersants, Fuel oil, Pollution prevention, Tankers, Beach cleanup

B. OIL POLLUTION PREVENTION AND CONTROL

Presented is the report of a steering group on contingency measures. Existing arrangements provide for a limited capability to disperse oil spills at sea that is regarded inadequate for a "worst case" oil spill event, and inappropriate for handling heavy fuel oil spills. The report recommends giving priority to the need to improve existing salvage procedures, the need for adequate beach cleaning arrangements, and the need for utilizing all possible means of preventing accidents, including a continuing international drive against sub-standard tankers.

79C-0815
OIL SPILL CONTROL ACTIVITIES OF THE PETROLEUM ASSOCIATION FOR THE CONSERVATION OF THE CANADIAN ENVIRONMENT (PACE)
Fern, G.R.H. 1979.
Spill Technology Newsletter 4(2):69-75.

Contingency planning, Spill cooperatives, Government agencies, Oil industry, Canada

Activities of the title association are summarized. The function of this organization is to coordinate contingency planning and cleanup response capability within the petroleum industry, among separate companies and regional spill cooperatives, and between industry and Canadian federal government agencies.

79C-0816
ENVIRONMENTAL POLLUTION IN OFFSHORE OPERATIONS
Gaskell, T.F. 1978.
Philosophical Transactions of the Royal Society of London, Series A 290 (1366):179-185.

International conventions, Government agencies, Oil industry, Contingency planning, IMCO, *UNEP

Efforts on the part of various international organizations to set up contingency plans for oil spill cleanup are described.

[from Petroleum Abstracts 19(17):#262,282. 1979]

79C-0817
THE ROLE OF EPA AND INDUSTRY IN PROTECTING OUR ENVIRONMENT
Karkalik, E.J. 1977.
52nd International Hydrocarbon Meas. Sch. Proc., Norman, Oklahoma, 12-14 April 1977. p. 509-151.

Contingency planning, Spill response, EPA, Oil industry, Guidelines, *Inland spills

B. OIL POLLUTION PREVENTION AND CONTROL

Spill contingency planning guidelines for inland transportation systems are presented. The inland environment is best protected by preventing the occurrence of spills through proper maintenance of equipment and training of personnel. When spills do occur, the importance of a comprehensive spill contingency plan becomes fully realized.

[from Petroleum Abstracts 19(26):#264,745. 1979]

6. Legal and Regulatory Aspects

79C-0818
THE ENVIRONMENTAL PROTECTION AGENCY WOULD CREATE A $6 BILLION "SUPERFUND" [news brief]
Anon. 1979.
Chemical Engineering 86(11):86.

Legislation, Spill cleanup, Spill removal, Liability, Insurance, EPA, Regulations, *Superfund

A fund to help states and localities clean up oil and other hazardous wastes is being proposed in new EPA legislation. Who will be assessed, how much, and on what basis are details which are still being resolved. EPA is stepping up its efforts in locating and cleaning up old toxic waste dumpsites.

79C-0819
GREENSHORE: DENMARK-CANADA MUTUAL ASSISTANCE IN OIL SPILLS
Anon. 1977.
Scanshore 1(2):57.

International agreements, Pollution prevention, Offshore, Spill cleanup, Greenland, Denmark, Canada

As a result of negotiations begun in late 1976, the Ministry for Greenland and the Canadian Ministry of Transport have signed an agreement providing for cooperation in preventing and combatting oil spills resulting from oil exploration activities in waters between Canada and Denmark.

[from Petrolem Abstracts 19(4):#258,388. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0820
MAJOR MARINE LEGISLATIVE ACTIONS IN THE 95TH CONGRESS
Anderson, A.W. 1978.
Oceans 78, 4th Annual Conference, Washington, DC, 6-8 September 1978. Marine Technology Society and Institute of Electrical and Electronics Engineers, 1978. p. 242-247.

Marine environment, Legislation, Regulations, Pollution prevention

More than 20 of the 278 public laws, enacted in the 95th Congress from 1 January 1977 - 21 May 1978, dealt with marine or ocean matters. Important legislation includes the National Advisory Committee on Oceans and Atmospheric Act of 1977, the Food and Agriculture Act of 1977, the amendments in 1977 to the Marine Protection, Research, and Sanctuaries Act of 1972, the Rivers and Harbors Improvements Act of 1978, and the National Ocean Pollution R&D and Monitoring Act of 1978.

[from Environment Abstracts 9(1):#79-00347. 1979]

79C-0821
THE ENVIRONMENTAL HERITAGE OF THE ARGO MERCHANT
Flanagan, J.V., and F.D. Hunter. 1978.
Boston College Environmental Affairs Law Review 7(1):1-30.

International conventions, Regulations, USCG, Tankers, Safety

The history and impact of the January 1977 Navigation Safety Regulations are presented. The statutory authority for USCG vessel control is the Port and Waterways Act of 1972. The prospects for domestically enforceable international standards appear bright.

[from Environment Abstracts 9(4):#79-02437. 1979]

79C-0822
SHIPBOARD OILY WATER POLLUTION - A PRACTICAL GUIDE FOR THE OWNER AND DESIGNER
Isaacson, A.D. 1979.
Offshore Technology Conference, 11th, Houston, Texas, 30 April - 3 May 1979. Vol. 4:2183-2192. No. OTC-3608. Preprint.

Tankers, Oil discharges, Regulations, IMCO, USCG, Oil-water separation, Equipment

This work is intended as a guide to recent IMCO and USCG regulations regarding shipboard oil pollution. Covered are various areas of potential water contamination and commercially available oil-water separators.

[from Petroleum Abstracts 19(21):#263,397. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0823
COAST GUARD EFFORTS TO PREVENT OIL POLLUTION CAUSED BY TANKER ACCIDENTS
US Congress. 1977.
House Committee on Government Operations Hearings 95th Congress I, 21, 23 March 1977. 554 p.

USCG, Regulations, Pollution prevention, Oil transport, Tankers

Hearings were held to assess the USCG's efforts to prevent and control oil pollution resulting from accidental tanker spills. The administration's proposed program for reducing the risks associated with marine transportation of oil is discussed.

[from Environment Abstracts 9(2):#79-01035. 1979]

7. General Prevention and Control Measures

79C-0824
AVOIDING CONTAMINATION OF LAKE MARACAIBO [in Spanish]
Anon. 1978.
Petroleo Internacional 36(8):27, 30, 34-35.

Pollution prevention, Lakes, Fisheries, *Lake Maracaibo

"Second only to the oil industry in Lake Maracaibo, the fishing industry thrives due to the antipollution measures Lagoven has developed and installed. Underwater pipelines, 12,400 active wells, and other installations are carefully watched to prevent spills."

[from Petroleum Abstracts 19(4):#258,393. 1979]

79C-0825
CORAL REEFS IN POTENTIAL CONFLICT WITH OIL AND GAS DEVELOPMENT
Anon. 1979.
Science 204(4395):812.

Coral reefs, Conservation, Oil-gas leasing, Development, Offshore, Drilling, Sedimentation, NOAA, Gulf of Mexico, *Marine sanctuary

Flower Gardens Coral Reef Banks, 120 nm south of the Texas/Louisiana border, has been nominated for a marine sanctuary under a NOAA program and may be in conflict with tracts leased for oil and gas exploration. BLM has prohibited drilling around 10 square miles of the reef while the proposed sanctuary would include 175 sq mi. Sedimentation from drilling operations constitutes the major threat to the fragile ecosystem.

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0826
UK POLLUTION PROTECTION REPORTS PUBLISHED [news brief]
Anon. 1979.
Marine Pollution Bulletin 10(4):99.

Pollution control, Contingency planning, Dispersants, Spill cleanup, Spill response, Equipment, UK

Four reports commissioned by Britain's secretary for Trade to review arrangements for pollution control have been issued. A spending program is recommended for a dispersant spraying system, a new oil recovery system, and establishment of two salvage equipment storage bases. One report emphasized "a critical deficiency in the government's forward planning for protection from pollution disasters."

79C-0827
PETROLEUM EXPLORATION AND PRODUCTION AT SEA - PROTECTION OF THE ENVIRONMENT
Author unknown. 1978.
Tech. Energie 15:30-33.

Offshore, Drilling, Pollution prevention, Blowout prevention, Equipment, Mediterranean Sea, North Sea

Examples of areas where offshore oil drilling has not resulted in significant pollution are given and some of the safety measures used in the drilling process are described.

[from Petroleum Abstracts 19(24):#264,152. 1979]

79C-0828
THE EUROPEAN OIL INDUSTRY AND THE ENVIRONMENT
CONCAWE. 1978.
CONCAWE Report 8/78. 25 p.

Pollution prevention, Oil industry, Exploration, Production, Oil transport, Refining, Europe

Environmental protection activities of the Western European oil industry, particularly in exploration and production, crude oil transport by sea, refining, and distribution, are reviewed.

[from Environment Abstracts 9(4):#79-02315. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0829
SHUTDOWN UNITS MEETING NEW CHALLENGES
Crawford, D. 1978.
Offshore 38(11):95-96, 98.

Blowout prevention, Oil wells, Drilling, Offshore, Pollution prevention, Safety, Equipment, Design-engineering

Emergency shutdown systems for offshore wells have continually undergone modification to meet growing technical and operational demands. Some of the improvements made in downhole shut-in valves, surface closures, sensors, safety valves and other equipment are described.

[from Petroleum Abstracts 19(3):#258,163. 1979]

79C-0830
QUALITY OF THE ENVIRONMENT IN JAPAN 1977
Environment Agency, Japan. 1977.
Japan, Environment Agency, 1977. v + 274 p.

Sources, Pollution prevention, Regulations, International agreements, Compensation, Japan

A general treatise on the state of the environment in Japan is presented. Chapter 3 contains a discussion of water pollution; oil is among the pollutants considered.

79C-0831
DEVELOPMENT TRENDS FOR BLOWOUT PREVENTION TOOLS [in Hungarian]
Jones, M.R. 1979.
Koolaj Foldgaz 11(12):357-368.

Blowout prevention, Design-engineering, Equipment, Drilling

The deeper wells are drilled for hydrocarbons, the more difficult the drilling conditions become. Strict safety and environmental protection regulations have considerable influence on blowout prevention tool design. Designing and manufacturing features meeting today's requirements are discussed.

[from Petroleum Abstracts 19(15):#261,626. 1979]

B. OIL POLLUTION PREVENTION AND CONTROL

79C-0832
ENVIRONMENTAL ASSESSMENT OF SOLID FOSSIL FUEL PROCESSES SYMPOSIUM
Pressey, R.E., C.H. Habenicht, and C.H. Prien. 1978.
Annual American Institute of Chemical Engineers Meeting, 71st, Miami Beach, 12-16 November 1978. Preprint No. 40b. 43 p.

Oil shale, Contamination, Monitoring, Pollution control, EPA, Sampling, Chemical analysis

An EPA sampling and analysis program was conducted by the Denver Research Institute. "A major objective of the program was the development of a prototype procedure which may be used to monitor potential pollutants and provide data for the selection of appropriate control devices. Difficulties in obtaining quantitative data and extrapolating the results to a full-scale retort are discussed."

[from Petroleum Abstracts 19(15):#261,675. 1979]

79C-0833
SERVICE: BLOWOUT CONTROL
Tapley, L. 1978.
Drilling Contractor 34(5):41-43.

Blowouts, Oil wells, Drilling, Pollution control

Two specialists in well fire and blowout control, E.O. Matthews and A. Hanson, have started their own emergency blowout control firm, Boots & Coots, Inc. The company has capped 15 wells since it began business.

[from Petroleum Abstracts 19(3):#258,146. 1979]

79C-0834
AQUATIC POLLUTANTS AND THEIR POTENTIAL BIOLOGICAL EFFECTS
Van Esch, G.J. 1977.
International 2nd Symposium on Aquatic Pollutants, Amsterdam, 26-28 September 1977. p. 1-11.

Health hazards, Carcinogens, Marine environment, Guidelines

The impact of aquatic pollution on human health and aquatic life is examined. A proposal for introducing safety factors to define a maximum concentration of a chemical allowable in the aquatic environment is presented, based on persistence, accumulation, and behavior of the toxicant. [possibly oil pollution related]

[from Environment Abstracts 9(2):#79-01365. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

79C-0835
OIL POLLUTION AFFECTS GREBES OFF NORTH WALES [news brief]
Anon. 1979.
Marine Pollution Bulletin 10(4):98.

Oil spills, Biological effects, Oil transfer, Birds, Mortality, UK, *Wales, *Podiceps cristatus

About 100 tons of oil lost during offloading operations at the Anglesey marine terminal drifted east, despite containment attempts, and have killed almost one fifth of the Great Crested Grebes (Podiceps cristatus) in their main wintering area in the Firth of Forth.

79C-0836
RESEARCH TO DETERMINE THE ACCUMULATION OF ORGANIC CONSTITUENTS, HEAVY METALS FROM PETROLEUM-IMPACTED SEDIMENTS BY MARINE DETRITIVORES OF THE ALASKAN OUTER CONTINENTAL SHELF
Anderson, J.W., G. Roesijadi, D.L. Woodruff, and E.A. Crecelius. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Report for the Year Ending March 1977, Vol. 12. p. 770-822.

Hydrocarbons, Benthos, Marine organisms, Sediments, Uptake, OCS, Alaska, *Deposit-feeders

When benthic organisms were exposed to oiled sediments, detectable levels of hydrocarbons were present in two deposit-feeding species, Phascolosoma agassizii and Macoma inquinata. These results suggest that mode of feeding is a determinate factor in the availability of sediment-sorbed hydrocarbons to benthic organisms. The feasibility of using bivalve condition index as an indicator of stress due to petroleum exposure was also tested.

[from Petroleum Abstracts 19(9):#260,097. 1979]

79C-0837
ECTOMYCORRHIZAL FUNGI OF SALIX ROTUNDIFOLIA TRAUTV. I. IMPACT OF SURFACE APPLIED PRUDHOE BAY CRUDE OIL ON MYCORRHIZAL STRUCTURE AND COMPOSITION
Antibus, R.K., and A.E. Linkins. 1978.
Arctic 31(3):366-380.

Crude oil, Biological effects, Plants, Chronic effects, *Salix rotundifolia

Over a three-year period, the effects of exposure to crude oil on the structure and quantity of viable mycorrhizae of the dwarf deciduous shrub, Salix rotundifolia, were investigated. Structural differences were noted one year after the application of oil by light and scanning electron microscopy. "The effect of oil in depressing the number of mycorrhizae was apparent three growing seasons after the application of oil."

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0838
THE EFFECTS OF AN EXPERIMENTAL SPILLAGE OF OIL SANDS TAILINGS SLUDGE ON BENTHIC INVERTEBRATES
Barton, D.R., and R.R. Wallace. 1979.
Environmental Pollution 18(4):305-312.

Oil spills, Tar sands, Sludge, Freshwater, Mortality, Toxicity, Benthos, Invertebrates, Rivers, Canada

Following a small experimental spillage of oil sands tailings in a small river in northern Alberta, Canada, a 60% reduction in the standing stock of benthic invertebrates occurred during a four-week period in the immediate area of the spill. Detailed results and recommendations are presented.

79C-0839
GULF UNDERWATER FLARE EXPERIMENT (GUFEX): EFFECTS OF HYDROCARBONS ON PHYTOPLANKTON
Brooks, J.M., G.A. Fryxell, D.F. Reid, and W.M. Sackett. 1977.
Report NSF/IDOE-77-207, Grants NSF-GX-3744, NSF-1DO73-09739. 33 p.

Hydrocarbons, Biological effects, Phytoplankton, Marine environment, Biomass, *GUFEX

The concentrations of hydrocarbons in the vicinity of two underwater vents observed were not high enough to produce any apparent effect on planktonic biomass or viability, except possibly in the immediate vicinity of the vent. The title experiments did not demonstrate that underwater venting of hydrocarbon gases is having any effect on phytoplantkon productivity or viability.

[from Government Reports Announcements 78(8):180. #PB-276 482. 1978]

79C-0840
DEVELOPMENT OF BIOLOGICAL INDICES FOR IDENTIFYING AND EVALUATING IMPACTS OF POLLUTANTS ON FRESHWATER ECOSYSTEMS
Cairns, J., E. Benfield, A. Buikema, K. Dickson, and A. Hendricks. 1977.
Report ORO-4939-4, Contract EY-76-S-05-4939. 188 p. Annual progress report, 1 June 1976 - 1 June 1977.

Biological effects, Contamination, Zooplankton, Microorganisms, Freshwater

The objectives of this study were to devise and evaluate biological methods for determining the functional response of aquatic organisms to perturbations. Structural and functional aspects of autotrophic and heterotrophic attached microbial communities were studied with emphasis on carbon, nitrogen, and sulfur. [possibly oil pollution related]

[from Government Reports Announcements 78(3):62. #ORO-4939-4. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0841
OIL POLLUTION AND TROPICAL LITTORAL COMMUNITIES
Chan, E.I. 1976.
University of Miaimi, Rosenstiel School of Marine and Atmospheric Science, Technical Report TR-76-3. 72 p.

Biological effects, Tropical regions, Intertidal zone

Summary not available.

[from Preliminary Bibliography on Oil Spills in Mangrove Forests. p. 3. 1979] Available from R.R. Lewis, Mangrove Systems, Inc., 5700 Memorial Hwy, Tampa, FL 33615.

79C-0842
NO. 2 FUEL OIL DECREASES EMBRYONIC SURVIVAL OF GREAT BLACK-BACKED GULLS
Coon, N.C., P.H. Albers, and R.C. Szaro. 1979.
Bulletin of Environmental Contamination and Toxicology 21(1/2):152-156.

Fuel oil, Biological effects, Birds, Mortality, Chronic effects, Reproduction, *Larus marinus

Clutches of eggs treated with 20 µl of oil/egg had significantly poorer survival at 8 days post-treatment than the control clutches, while no difference was noted between 5 µl of oil/egg and control clutches. Both the 5 µl and 20 µl oil applications significantly reduced hatchability of artificially incubated eggs." The study supported findings of previous studies with mallards and eiders.

79C-0843
AN AUTOMATED DEVICE (AGARS) FOR STUDYING AVOIDANCE OF POLLUTANT GRADIENTS BY AQUATIC ORGANISMS
Cripe, C.R. 1979.
Journal of the Fisheries Research Board of Canada 36(1):11-16.

Biological effects, Marine organisms, Toxicity, Behavior

The title device was developed to simplify limitations of organism testing in steep pollutant gradients. This Aquatic Gradient Avoidance Response System (AGARS) allows animals to choose between one contaminated zone and three increasingly toxic zones. Data are accumulated hourly and processed by a paper tape reader/calculator/plotter system.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0844

THE PHYSIOLOGICAL EFFECTS OF ACUTE AND CHRONIC EXPOSURE TO HYDROCARBONS ON NEAR-SHORE FISHES OF THE BERING SEA
Devries, A.L. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Report for the Year Ending March 1977, Vol. 12. p. 1-22.

Hydrocarbons, Fish, Uptake, Toxicity, Metabolism, Bering Sea, *Naphthalene

In the title study, sculpins were shown to take up naphthalenes from the environment, although little effect was noted on the biosynthesis of plasma proteins of peptide antifreeze. Morphogenic studies indicated deterioration of the liver, but the direct cause was not determined. "The normal rate of protein synthesis in the naphthalene exposed fishes suggests that compensatory mechanisms exist to maintain a constant synthetic rate of liver proteins."

[from Petroleum Abstracts 19(9):260,091. 1979]

79C-0845

ACUTE AND CHRONIC STUDIES WITH WATERFOWL EXPOSED TO PETROLEUM HYDROCARBONS
Dieter, M.P. 1977.
Environmental Effects of Energy Related Actities on Marine/Estuarine Ecosystems. C. Hall, and W. Preston (eds.). Report EPA-600/7-77-III. p. 35-42. Proceedings.

Hydrocarbons, Acute effects, Chronic effects, Toxicity, Mortality, Birds, Wildlife, Analytical techniques

Embryo toxicity, comparative age mortalities, morphological and biochemical responses from oil ingestion and biochemical reactions of waterfowl are discussed in the title study. Mallards and common eiders were the primary test birds. The development of analytical capability for petroleum hydrocarbons was also studied.

79C-0846

TOXICITY OF WATER SOLUBLE FRACTIONS OF PETROLEUM OILS ON LARVAE OF CRABS
Donahue, W.H., M.F. Welsh, W.Y. Lee, and J.A.C. Nicol. 1977.
Report NSF/IDOE-78-24, Grant ID073-09740. 1977.

WSF, Biological effects, Toxicity, Mortality, Crustaceans

Survival of six species of crabs in WSFs of petroleum oils was investigated. Mortality rates of the crab species at various concentrations are given. In 24 hr experiments, petroleum derivatives, fuel oil, and Bunker C were more toxic than crude oils.

[from Government Reports Announcements 78(15):170. #PB-279 103. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0847
SEA OTTERS AT RISK FROM OIL SPILLS [news brief]
Ellis, D.V. 1979.
Marine Pollution Bulletin 10(3):68.

Oil spills, Environmental effects, Marine mammals, Mortality, Behavior, Canada, *British Columbia, *Enhydra lutris

An investigation of an Enhydra lutris repopulation area in British Columbia, Canada has concluded that "such constrained socially based behavior renders a pelage-dependent animal particularly vulnerable to oil spills." The study recommends a wide dispersion of transplant colonies to avoid total colony elimination by a single spill.

79C-0848
HYDROCARBON STRESS IN COASTAL WETLANDS
Frey, M.G. 1976.
Coastal Society Second Annual Conference, New Orleans, 17-20 November 1976. p. 179-220.

Hydrocarbons, Coasts, Chronic effects, Ecosystems, *Wetlands

The geological conditions necessary to have a major seep or oil field in a coastal zone are outlined. Petroleum operations in the Gulf of Alaska, the Louisiana Marsh, and the Southern California Marshes are described. Field studies on marine life inhabiting areas of chronic low-level exposure to petroleum reveal no measurable effects.

[from Environment Abstracts 8(2):#78-01129. 1978]

79C-0849
EFFECTS OF PETROLEUM HYDROCARBONS ON SALT MARSH COMMUNITIES
Hershner, C.H. 1977.
Ph.D. Dissertation, University of Virginia, 1977. 172 p.

Marshes, Fuel oil, Crude oil, Sublethal effects, Models, Sampling

Three experiments were conducted in the title study: 1) A small pocket marsh was repeatedly dosed with small amounts of No. 2 fuel oil; 2) a large accidental spill of No. 6 fuel oil was investigated; 3) single doses of fresh and weathered crude oil were applied to artificially enclosed segments of the marsh. "The variety and complexity of oil pollution effects on salt marsh communities is seen to confound attempts to develop predictive models...Specifically discussed are projects for mats for studying natural marsh systems selection of the scope of the research, and design of the sampling program."

[from Petroleum Abstracts 19(8):#259,788. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0850
THE EFFECTS OF INGESTED PETROLEUM ON OVIPOSITION AND SOME ASPECTS OF REPRODUCTION IN EXPERIMENTAL COLONIES OF MALLARD DUCKS (ANAS PLATYRHYNCHOS)
Holmes, W.N., K.P. Cavanaugh, and J. Cronshaw. 1978.
Journal of Reproduction and Fertility 54(2):335-346.

Birds, Crude oil, Chronic effects, Reproduction, Growth

Unmated mallard ducks given food contaminated with 3 ml South Louisiana crude oil/100 g dry wt. showed an 84% decline in the daily rate of oviposition, a 33% decrease in egg-shell thickness, and, at autopsy, an ovarian mass of more than 82% atretic follicles. Similar studies on mated females showd that 1 ml of South Louisiana crude oil/100 g dry food had no effect on daily rate of oviposition, but none of the eggs were fertilized; 3 ml South Louisiana crude oil/100 g dry food suppressed the daily rate of oviposition significantly. Less than 25% of these eggs were fertilized, and only 40% of the fertilized eggs yielded viable ducklings. The addition of 1 ml Kuwait crude oil/100 g of dry food had no effect on the rate of oviposition, the incidence of fertility, or the hatchability of the fertilized eggs.

79C-0851
HYDROCARBONS AND MICROBIAL ACTIVITIES IN SEDIMENT OF AN ARCTIC LAKE ONE YEAR AFTER CONTAMINATION WITH LEADED GASOLINE
Horowitz, A., A. Sexstone, and R.M. Atlas. 1978.
Arctic 31(3):180-191.

Gasoline, Biological effects, Sediments, Biodegradation, Microorganisms, Chronic effects, Lakes, Arctic

Hydrocarbons from accidentally spilled leaded gasoline were found to persist in lake waters after one year. High numbers of hydrocarbon-utilizing microorganisms were found in contaminated sediment. While nitrogen-fixing activities did not seem to be affected by the contamination, potential denitrification activities appeared to be altered. Fertilizer application resulted in a moderate decrease of sediment hydrocarbon concentrations.

79C-0852
EFFECT OF PETROLEUM HYDROCARBONS ON MICROBIAL POPULATIONS IN AN ARCTIC LAKE
Jordan, M.J., J.E. Hobbie, and B.J. Peterson. 1978.
Arctic 31(3):170-179.

Crude oil, Biological effects, Microorganisms, Sediments, Bacteria, Toxicity, Lakes, Arctic

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

An enclosed section of a lake was exposed to Prudhoe crude in July 1976. One year later, no significant differences were detected in this oiled water/sediments versus those of the control area in rates of glucose turnover. There were no differences in numbers of sediment bacteria. Several methods for using ^{14}C-labelled hydrocarbons in field situations were presented.

79C-0853
EFFECTS OF LOW TEMPERATURES ON THE SURVIVAL OF PINK SALMON AND SHRIMP EXPOSED TO TOLUENE, NAPHTHALENE, AND THE WATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL
Korn, S., D.A. Moles, and S.D. Rice. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 12. p. 66-84.

Crude oil, Hydrocarbons, WSF, Fish, Crustaceans, Mortality, Toxicity, Acute effects, *Temperature effects

The title study yielded the following results: 1) Exposure concentrations declined with time and at different rates for each temperature, simulating a point source spill; 2) the effects observed at different temperatures were dependent on species and toxicant; 3) survival of toluene- and naphthalene-exposed shrimp was significantly less at higher temperatures.

[from Petroleum Abstracts 19(9):#260,094. 1979]

79C-0854
EFFECTS OF TEMPERATURE ON THE MEDIAN TOLERANCE LIMIT OF PINK SALMON AND SHRIMP EXPOSED TO TOLUENE, NAPHTHALENE, AND COOK INLET CRUDE OIL
Korn, S., D.A. Moles, and S.D. Rice. 1979.
Bulletin of Environmental Contamination and Toxicology 21(4/5):521-525.

Crude oil, Aromatic hydrocarbons, Biological effects, Toxicity, Mortality, Fish, *Oncorhynchus gorbuscha, *Eualus spp., *Pandalus goniurus

The prediction of decreased survival at lower temperature because of increased hydrocarbon persistence was not uniformly confirmed in this study. Methods, results, and discussion are presented.

79C-0855
ECOTOXICOLOGICAL REVIEW OF GLOBAL IMPACT OF PETROLEUM INDUSTRY AND ITS PRODUCTS
Korte, F., and E. Boedefeld. 1978.
Ecotoxicology and Environmental Safety. 48 p. (Survey Report)

PAH, Toxicity, Ecosystems, Oil industry, Oil discharges

Long-term effects of petroleum hydrocarbon seepage into the environment have yet to be determined, and a thorough examination of the potential problems posed by PAHs has not been conducted. Ecotoxicological projections are needed to gauge the effects of petroleum products that are released into the environment.

[from Environment Abstracts 9(4):#79-02305. 1979]

79C-0856
ON THE UPTAKE OF THREE DIFFERENT TYPES OF HYDROCARBONS BY SALMON EGGS (SALMO SALAR L.)
Kuehnhold, W.W., and F. Busch. 1978.
Meeresforschung 26(1-2):50-59.

Uptake, Aromatic hydrocarbons, Metabolism, Fish, *Salmo salar L.

The differences in accumulation of naphthalene, 3,4-benzopyrene, and n-hexadecane in salmon eggs just prior to hatching was compared. Hexadecane accumulation and penetration was much slower than that of the other two hydrocarbons; penetration was fastest for naphthalene. Hydrocarbons that penetrated the chorion were accumulated most in the yolk and egg fluid. The data are discussed in regard to possible hydrocarbon metabolism.

[from Chemical Abstracts 89(15):#124025u. 1978]

79C-0857
ACCUMULATION AND TURNOVER OF PETROLEUM HYDROCARBONS IN MARINE ORGANISMS (CHAPTER 6)
Lee, R.F. 1976.
Report NSF/IDOE-77/147, Grant NSF-OCE74-05283. 10 p.

Hydrocarbons, Marine organisms, Uptake, Depuration, Mollusks, Biological effects, *Bivalves

This review deals with the uptake, storage, and discharge of petroleum hydrocarbons by marine organisms under laboratory and field conditions. Bivalves including mussels, clams, and oysters have received special emphasis.

[from Government Reports Announcements 78(3):62. #PB-273 407. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0858
FATE OF PETROLEUM HYDROCARBONS IN MARINE ANIMALS
Lee, R.F. 1977.
Report NSF/IDOE-78/2, Grant NSF-OCE76-84108. 5 p.

Hydrocarbons, Uptake, Metabolism, Marine organisms, Biological effects, Bioindicators, Mollusks, *Detoxification mechanisms

The title article discusses the various hydrocarbon detoxification mechanisms in crabs, worms, and fish, and compares these with the accumulation of hydrocarbons in bivalves. Bivalves, lacking the detoxification mechanisms are being investigated as bioindicators to monitor marine pollution.

[from Government Reports Announcements 78(11):91. #PB-277 468. 1978]

79C-0859
CHRONIC SUBLETHAL EFFECTS OF THE WATER SOLUBLE FRACTIONS OF NO. 2 FUEL OILS ON THE MARINE ISOPOD, SPHAEROMA QUADRIDENTATUM
Lee, W.Y. 1978.
Marine Environment Research 1(1):5-17.

Sublethal effects, Fuel oil, WSF, Crustaceans, Growth, Reproduction

The growth rate of juvenile isopod exposed to No. 2 fuel oil was reduced by oil concentrations of greater than 3%, and fecundity was depressed at oil concentrations greater than 1%. Adult isopods were exposed to the WSFs of four fuel oils for 1 mo; fecundity was depressed at concentrations greater than 15% for all oils.

[from Environment Abstracts 9(4):#79-02429. 1979]

79C-0860
OIL POLLUTION - HOW MUCH MISPLACED EFFORT? [editorial]
Lewis, J.R. 1979.
Marine Pollution Bulletin 10(4):94-95.

Oil spills, Biological effects, Spill response, Contingency planning, Environmenal effects

The author suggests that a great deal of the energy spent in assessing the biological damage resulting from oil spills might be used to better advantage elsewhere. Failing to find any real results in the host of studies being conducted other than "on the spot advice about the type of treatment which best avoids making a bad situation worse," Lewis suggests that "the whole field of pollution oriented biology needs some re-appraisal."

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0861
ECTOMYOCORRHIZAL FUNGI OF SALIX ROTUNDIFOLIA TRAUTV. II. IMPACT OF SURFACE APPLIED PRUDHOE BAY CRUDE OIL ON MYCORRHIZAL ROOT RESPIRATION AND COLD ACCLIMATION
Linkins, A.E., and R.K. Antibus. 1978.
Arctic 31(3):381-393.

Crude oil, Biological effects, Plants, Soil, *Salix rotundifolia

Ectomyocorrhizal root tips of title species showed decreased respiration within 48 hrs after surface application of oil. Respiration rates of tips treated with 5 L/m^2 and 12 L/m^2 and stages of recovery are discussed. Viable root biomass declined from year to year in oiled soils. Cold acclimation after oil treatment applied to roots of title species is discussed.

79C-0862
SUBLETHAL EFFECTS ON SEAGRASS PHOTOSYNTHESIS
McRoy, C.P., and S.L. Williams. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 12. p. 636-665.

Hydrocarbons, Plants, Sublethal effects, *Photosynthesis

The sublethal effects of petroleum contamination on seagrass were determined primarily on the basis of C^{14} uptake kinetics. Hydrocarbon-exposed plants exhibited decreased productivity, and plants treated with toluene were visibly affected after 5.5 hr. Plants exposed to hydrocarbons in situ showed no serious effects.

[from Petroleum Abstracts 19(9):#260,096. 1979]

79C-0863
METABOLIC FATE OF AROMATIC HYDROCARBONS IN AQUATIC ORGANISMS: ANALYSIS OF METABOLITES BY THIN-LAYER CHROMATOGRAPHY AND HIGH-PRESSURE LIQUID CHROMATOGRAPHY
Malins, D.C., T.K. Collier, L.C. Thomas, and W.T. Roubal. 1979.
International Journal of Environmental Analytical Chemistry 6(1):55-66.

Aromatic hydrocarbons, Fish, Metabolism, Chemical analysis, Chromatography

"Aquatic organisms convert aromatic hydrocarbons into a variety of conjugated and nonconjugated derivatives. Analytical techniques based on thin-layer chromatography (TLC) and high-pressure liquid chromatography (HPLC) were employed to separate, identify and quantitate individual metabolites from fish exposed to radiolabeled naphthalene and 2,6-dimethylnaphthalene. Significant differences in profiles of individual metabolites were found in relation to the type of biological sample analyzed."

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0864
SUBLETHAL EFFECTS ON [sic] PETROLEUM HYDROCARBONS AND TRACE METALS, INCLUDING BIOTRANSFORMATIONS, AS REFLECTED BY MORPHOLOGICAL, CHEMICAL, PHYSIOLOGICAL, PATHOLOGICAL, AND BEHAVIORAL INDICES
Malins, D.E., E.H. Gruger, Jr., H.O. Hodgins, and D. Weber. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 12. p. 125-298.

Hydrocarbons, Bioassay, Sublethal effects, Fish, Crustaceans

Laboratory studies indicated that adult and post larval shrimp were susceptible to low levels of naphthalene in seawater and strongly suggest that petroleum introduced into the environment of these and related animals would have deleterious effects. The observed structural changes in salmonid fish following exposure to hydrocarbons and trace metals further implies that the presence of these compounds in diet, water, or sediment would be harmful to the salmon and flatfish.

[from Petroleum Abstracts 19(9):#260,095. 1979]

79C-0865
EFFECTS OF COOK INLET CRUDE OIL, BENZENE, AND NAPHTHALENE ON HEART RATES OF THE ALASKAN KING CRAB (PARALITHODES CAMTSCHATICA)
Mecklenburg, T.A., and S.D. Rice. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 12. p. 85-125.

Crude oil, Aromatic hydrocarbons, Sublethal effects, Respiration, *Heart rate, *Napthalene, *Benzene, *Paralithodes camtschatica, Alaska

Heart rates of the king crab were continuously monitored during and after exposure to the title compounds. Respiration was monitored in one of the crude oil experiments and closely paralled the changes in heart rate. Benzene caused earlier onset of and more severe and prolonged heart rate depressions than naphthalene or crude oil.

[from Petroleum Abstracts 19(9):#260,084. 1979]

79C-0866
THE EFFECTS OF OIL SPILLS ON PHYTOPLANKTON IN ARCTIC LAKE AND PONDS
Miller, M.C., V. Alexander, and R.J. Barsdate. 1978.
Arctic 31(3):192-218.

Crude oil, Biological effects, Phytoplankton, Lakes, Freshwater, Arctic

Bioassay experiments are discussed which took place over a period of seven years in seep and spill-affected waters including tundra thaw ponds and a morainal lake. "The zooplankton populations were virtually eliminated, and after an initial depression of primary productivity the photosynthetic rates returned to approximately prespill levels with a small increase in algal biomass." Biomass experiments suggested that direct inhibition of algal photosynthesis in lakes may be important although zooplankton were greatly reduced.

79C-0867
FUNGAL BIOMASS RESPONSES IN OIL PERTURBATED TUNDRA AT BARROW, ALASKA
Miller, O.K., Jr., A.E. Linkins, and M.A. Chmielewski. 1978.
Arctic 31(3):394-407.

Crude oil, Biological effects, Fungi, Alaska, *Tundra

Effects of Prudhoe crude at concentrations of 5 L/m^2 and 12 L/m^2 on fungal hyphae/gm and the grams of mycelium/m^2 were studied for three seasons on a polygonal tundra. Significant depressing effects for three seasons were noted. "Shifts occur in fungal populations in the presence of oil and the presence of oil biodegration by filamentous fungi was detected." The influence of bulk density on fungal populations and the penetration of oil into tundra soil is discussed.

79C-0868
WATER POLLUTION MICROBIOLOGY. VOL. 2
MITCHELL, R. (ed.). 1978.
New York, John Wiley & Sons, 1978. ix + 442 p.

Microorganisms, Biodegradation, Health hazards, Pollution control

The title volume, which contains 16 chapters, examines microorganisms as causative agents of ecological and public health hazards in natural waters, and treats the use of microorganisms in pollution control from a variety of perspectives. Petroleum pollution is mentioned, with specific emphasis given in Chapter 5, Microbial Degradation of Industrial Pollutants (R.R. Cowell and G.S. Sayler).

79C-0869
EFFECTS OF CRUDE OIL ON AQUATIC INSECTS OF TUNDRA PONDS
Mozley, S.C., and M.G. Butler. 1978.
Arctic 31(3):229-241.

Crude oil, Biological effects, Toxicity, Alaska, *Aquatic insects, *Tundra

The title study discusses the effects of oil pollution on several tundra thaw pond insects including the caddis fly, the stonefly, the beetle Agabus, and larvae of the fly family Chironomidae. The studies correlate various mortality rates with differing concentrations of oil. The study recommends avoidance of solvent and dispersant use in cleanup operations.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0870
EFFECTS OF THE WATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL ON THE MARINE ALGA, DUNALLIELA TERTIOLECTA
Nunes, P., and P.E. Benville, 1979.
Bulletin of Environmental Contamination and Toxicology 21(6):727-732.

Crude oil, WSF, Biological effects, Marine environment, Algae, *Dunalliela tertiolecta

This study attempts to determine the effects of WSFs of Cook Inlet crude oil on a marine alga without the addition of emulsifying agents. Results indicated, among other things, that a low WSF concentration has a stimulating effect on the title marine alga.

79C-0871
UPTAKE AND DEPURATION OF PETROLEUM HYDROCARBONS IN THE MANILLA CLAM, TAPES SEMIDECUSSATA REEVE
Nunes, P., and P.E. Benville. 1979.
Bulletin of Environmental Contamination and Toxicology 21(6):719-726.

Hydrocarbons, Biological effects, Uptake, Depuration, Mollusks, *Tapes semidecussata

This study examines the sensitivity of the manilla clam to petroleum hydrocarbons and its ability to accumulate and store these materials in their tissues. Results and discussions are presented.

79C-0872
TOXICITY OF PRUDHOE BAY CRUDE OIL TO ALASKAN ARCTIC ZOOPLANKTON
O'Brien, J.W. 1978.
Arctic 31(3):219-228.

Crude oil, Biological effects, Zooplankton, Toxicity, Bioassay, Arctic, Alaska

Bioassay experiments were conducted to determine relative susceptibilities of three arctic zooplankton species to oil pollution. Results were compared to an actual spill near Barrow. Cyclopoid copepods were the only zooplankton able to survive the pond spill. The deaths of the other species, especially the branchiopods, suggest that zooplankton may be the most susceptible of all arctic freshwater organisms to oil pollution.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0873
DISAPPEARANCE OF AROMATIC HYDROCARBONS AND ORGANIC SULFUR COMPOUNDS FROM FISH FLESH REARED IN CRUDE OIL SUSPENSION
Ogata, M., and Y. Miyake. 1978.
Water Research 12(12):1041-1044.

Aromatic hydrocarbons, Crude oil, Uptake, Depuration, Fish, *Anguilla japonica, *Sulfur

Following exposure of Anguilla japonica to seawater containing a crude oil suspension of organic sulfur compounds, benzene, toluene and xylene were found to disappear in the eel flesh while sulfur compounds were still present after 30 days.

[from Petroleum Abstracts 19(17):#262,262. 1979]

79C-0874
THE PETROLEUM INDUSTRY IN THE DELAWARE ESTUARY. REPORT OF WORK COMPLETED, 1974-1976
Patrick, R., and W. Whipple. 1977.
Report NSF/RA-77/0429, Grant NSF-ENV74-14810-A03. 450 p.

Petroleum products, Crude oil, Sources, Biological effects, Toxicity, Fish, Shellfish, Delaware Bay, *Urban runoff

The title report provides a comprehensive evaluation of all sources of petroleum in the Delaware estuary and indicates that urban runoff and unrecorded sources constitute a major part of the total load. Included are discussions of specific toxicity levels of different petroleums and petroleum products on fish, shellfish, and other organisms. Life cycle studies indicate a much higher degree of toxicity than acute bioassay tests. Ultraviolet irradiation of No. 2 fuel oil and Iranian crude greatly increase their toxicities.

[from Government Reports Announcements 78(12):161. #PB-277 962. 1978]

79C-0875
EFFECTS OF PETROLEUM EXPOSURE ON HATCHING SUCCESS AND INCUBATION BEHAVIOR OF GLAUCOUS-WINGED GULLS
Patten, S.M., Jr., and L.R. Patten. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 12. p. 418-448.

Crude oil, Petroleum products, Birds, Toxicity, Mortality, Alaska, *Hatching, *Larus glaucescens

North Slope crude oil and mineral oil were studied for the title effects on Larus glaucescens, a seabird inhabiting an area susceptible to oil spills in the Cooper River Delta in Alaska. Egg oiling experiments indicated that both crude and mineral oils resulted in high mortality rates.

[from Petroleum Abstracts 19(9):#260,086. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0876
POLLUTION EFFECTS ON INTERTIDAL MACROBENTHIC COMMUNITIES
Reed, P.A., T. Renshaw, and K.J. Anderson. 1978.
Journal of Applied Ecology 15(1):15-31.

Benthos, Marine organisms, Distribution, Environmental effects, Intertidal zone, Scotland

A study undertaken to observe and quantify differences in community structure at different places, in different states of pollution, on the south shore of the outer Firth of Forth, Scotland, is described. "Results indicate that gross pollution diminishes both dominance diversity and species diversity, while more moderate pollution reduces species diversity but is less effective in regulating dominance diversity." The four different methods used to measure diversity are explained.

[from Environment Abstracts 9(1):#79-00316. 1979]

79C-0877
LETHAL AND SUBLETHAL EFFECTS ON SELECTED ALASKAN MARINE SPECIES AFTER ACUTE AND LONG-TERM EXPOSURE TO OIL AND OIL COMPONENTS
Rice, S.D., S. Korn, and J.F. Karinen. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 12. p. 23-43.

Hydrocarbons, WSF, Marine organisms, Toxicity, Acute effects, Sublethal effects, Recovery, Alaska

Recovery rates of selected organisms and ecosystems of the Gulf of Alaska, Bering Sea, and Beaufort Sea following contamination or other perterbations associated with petroleum development were studied in the laboratory and field. Studies on the acute toxicity of crude oil WSFs were continuing with emphasis on intertidal organisms.

[from Petroleum Abstracts 19(9):#260,092. 1979]

79C-0878
THE ACCUMULATION OF LOW MOLECULAR WEIGHT AROMATIC HYDROCARBONS OF CRUDE OIL BY COHO SALMON (ONCORHYNCHUS KISUTCH) AND STARRY FLOUNDER (PLATICHTHYS STELLATUS)
Roubal, W.R., et al. 1978.
Archives of Environmental Contamination and Toxicology 7(2)::237-244.

Fish, Crude oil, Aromatic hydrocarbons, WSF, Toxicity, Contamination, *Bioaccumulation

A complex spectrum of low molecular weight aromatic hydrocarbons was accumulated in the title species exposed to .9 ± .1 ppm of a WSF of Prudhoe Bay crude oil in flowing sea water. Water soluble aromatic hydrocarbons were readily accumulated in muscles, liver, and gills of starry flounder and muscle of coho salmon exposed to 1 ppm of WSF of crude oil. Species differences in the ability to bioconcentrate the aromatic hydrocarbons suggest that demersal fish may be more susceptible than pelagic fish to petroleum contamination.

[from Environment Abstracts 8(7/8):#78-03929. 1978]

79C-0879
LONG TERM INTERACTIONS OF MICROORGANISMS AND PRUDHOE BAY CRUDE OIL IN TUNDRA SOILS AT BARROW, ALASKA
Sextone, A., K. Everett, T. Jenkins, and R.M. Atlas. 1978.
Arctic 31(3):348-354.

Crude oil, Biological effects, Oil spills, Microorganisms, Alaska, *Tundra

Oil was recovered 2 to 7 years after spillage. Penetration characteristics are discussed. "Numbers of microorganisms were different in oil contaminated and reference soils generally showing enrichment, but in some soils showing inhibition of microbial populations."

79C-0880
RESPONSE OF MICROORGANISMS TO HOT CRUDE OIL SPILLS ON A SUBARCTIC TAIGA SOIL
Sparrow, E.B., C.Y. Davenport, and R.C. Gordon. 1978.
Arctic 31(3):324-338.

Crude oil, Biological effects, Bacteria, Soil, Fungi, Yeasts, Toxicity, Chronic effects, Biodegradation, Subarctic regions, Alaska

After a winter spill, filamentous fungal populations were inhibited, whereas heterotropic bacterial populations were stimulated. After a summer spill both populations showed an inital depression followed by general enhancement. In both plots, yeasts, and denitrifying, proteolytic, oil-utilizing, and cellulose-utilizing microorganisms were favorably affected by the oil.

79C-0881
SUBLETHAL EFFECTS OF TREATED LIQUID EFFLUENT FROM A PETROLEUM REFINERY ON FRESHWATER ORGANISMS
Sprague, J.B. et al. 1978.
Fisheries and Environment of Canada Report. 297 p.

Fish, Sublethal effects, Toxicity, Bioassay, Wastewaters, Refineries, Bioindicators

Rainbow trout (Salmo gairdneri), tropical flagfish (Jordanella floidae), and Daphnia pulex were tested for sublethal effects using treated effluent from a Canadian petroleum refinery. Threshold for effects on trout was about 10% concentration, and for flagfish, about 9%. Daphnia pulex was killed in two days by 76% effluent, and was 2.5 times as sensitive as trout. Two-day lethal tests with Daphnia would be valuable as a rapid bioassay for monitoring toxicity of refinery effluents.

[from Environment Abstracts 9(1):#79-00654. 1979]

79C-0882
EFFECTS OF CHRONIC INGESTION OF SOUTH LOUISIANA CRUDE OIL ON MALLARD DUCKLINGS
Szaro, R.C., M.P. Dieter, G.H. Heinz, and J.F. Ferrell. 1978.
Environmental Research 17(3):426-436.

Toxicity, Sublethal effects, Growth, Mortality, Birds, *Anas platyrhynchos

"South Louisiana crude oil was fed to duckling mallards (Anas platyrhynchos) in concentrations of 0.025, 0.25, 2.5 and 5% of the diet from hatching to 8 weeks of age to assess the effects of chronic oil ingestion during early development." In general, during critical early developmental stages, oil ingestion depresses growth, impairs avoidance behavior, and causes pathological changes in liver and kidney, but does not by itself cause mortality. Oil ingestion does generally weaken the condition of the bird and may contribute to increased mortality during periods of stress.

79C-0883
BAHIA SUCIA: A RE-EVALUATION OF THE BIOTA AFFECTED BY PETROCHEMICAL CONTAMINATION IN MARCH 1973
Tosteson, T.R., et al. 1977.
University of Puerto Rico, Department of Marine Science. 138 p. + appendices.

Contamination, Plants, Animals, Petrochemicals

Summary not available.

[from Preliminary Bibliography on Oil Spills in Mangrove Forests. p. 3. 1979] Available from R.R. Lewis, Mangrove Systems, Inc., 5700 Memorial Hwy., Tampa, FL 33615.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0884
EFFECT OF PETROLEUM DISPERSANTS ON THE SURVIVAL AND GROWTH OF *IDOTEA BALTICA* (CRUSTACEA, ISOPODA) [in Russian]
Tsikhon-Lukanina, E.A., I.N. Soldatova, T.A. Lukasheva, and N.M. Antonova. 1976.
Deposited Document VINITI 3164-76. 12 p.

Dispersants, Toxicity, Crustaceans, Mortality, Growth, **Idotea baltica*

The dispersants Corexit 7664 at concentrations 0.0001, 0.001, and 0.1 g/L, and EPN-4 at concentrations 0.0001 and 0.001 g/L had no effect on the survival or the growth of immature and mature *Idotea baltica*. EPN-4 at 0.01 g/L, however, was lethal to the animals.

[from Chemical Abstracts 89(17):#141350p. 1978]

79C-0885
EFFECTS OF SUB-LETHAL OIL LEVELS ON THE REPRODUCTION OF A COPEPOD, '*NITOCRA AFFINIS*'
Ustach, J.F. 1977.
Report UNC-SG-76-10, NOAA-78012003, Grant NOAA-04-6-158-44054. 22 p.

WSF, Biological effects, Toxicity, Mortality, Sublethal effects, Reproduction, *Copepod, **Nitocra affinis*

Findings of the title study indicate that the soluble fraction from 200 ml/L of sea water significantly reduced egg production by the harpacticoid copepod *Nitocra affinis* as did one-half and one-fourth dilutions of the oiled water with seawater.

[from Government Reports Announcements 78(11):93. #PB-278 129. 1978]

79C-0886
UPTAKE AND RELEASE OF NAPHTHALENE AND ITS METABOLITES IN SKIN AND EPIDERMAL MUCUS OF SALMONOIDS
Varanasi, U., M. Uhler, and S.I. Stranahan. 1978.
Toxicology and Applied Pharmacology 44:277-289.

Aromatic hydrocarbons, Fish, Uptake, Metabolism, Depuration, *Naphthalene

Rainbout trout (*Salmo gairdneri*) were exposed to naphthalene via force feeding, ip injection, or flowing water. Concentrations of naphthalene and its metabolites in skin increased initially and subsequently declined. Skin and liver both exhibited a tendency to retain the metabolites over the naphthalene. Analyses of the epidermal mucus suggest that it is involved in the excretion of hydrocarbons and their metabolites.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0887
TOXICITY TESTS OF OIL DISPERSANTS ON SOME MARINE ANIMALS
Verlencar, X.N., N.B. Bhosle, and A.H. Parulekar. 1977.
Mahasagar 10(3-4):109-115.

Dispersants, Toxicity, Marine organisms, Concentrations, Mortality, Mollusks

The median lethal concentrations of 4 oil dispersants to green mussel (Mytilus viridis) ranged from 0.085 to >10 ppm after 24-hr exposure, and 0.079 to >10ppm after 48 or 96 hr exposure; most mortality occurred within 48 hrs. In general the toxicity of the dispersants alone was much greater than that of oil-dispersant mixtures.

[from Chemical Abstracts 89(15):#123986w. 1978]

79C-0888
EFFECT OF CRUDE AND DIESEL OIL SPILLS ON PLANT COMMUNITIES AT PRUDHOE BAY, ALASKA, AND THE DERIVATION OF OIL SPILL SENSITIVITY MAPS
Walker, D.A., P.J. Webber, K.R. Everett, and J. Brown. 1978.
Arctic 31(3):242-259.

Crude oil, Biological effects, Plants, Toxicity, Recovery, Contingency planning, Alaska, *Diesel

Crude oil was spilled on six major Prudhoe Bay plant communities occurring along a topographic moisture gradient. Results are discussed for sedges, willows, mosses, lichens, and others. Generally, dry plots showed a poor recovery and wet plots a good recovery. Diesel oil killed all species except an aquatic moss. A predictive sensitivity was prepared for an accidental crude spill. Implications of the experiments and mapping for oil spill contingency planning were discussed.

79C-0889
EFFECTS OF NO. 2 FUEL OIL ON THE HATCHABILITY OF MARINE AND ESTUARINE BIRD EGGS
White, D.H., K.A. King, and N.C. Coon. 1979.
Bulletin of Environmental Contamination and Toxicology 21(1/2):7-10.

Fuel oil, Biological effects, Birds, Mortality, Toxicity, Reproduction

Mortality rates of 61%, 56%, and 83% were noted for treated eggs of Louisiana herons, sandwich terns, and laughing gulls, respectively. Stress on eggs during shipment may have played a role in reduction of hatchability rates in both groups.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0890
A CONFIRMATION OF THE CORRELATION BETWEEN HYDROCARBONS AND CHLOROPHYLL A IN THE UPPER EUPHOTIC ZONE
Zsolnay, A. 1979.
Marine Pollution Bulletin 10(4):107-108.

Biological effects, Hydrocarbons, Chemical effects, Microorganisms, *Chlorophyll

Described are the methods and results validating a correlation previously developed which proposed a relationship between any hydrophobic compound capable of being produced by the biosphere and some indicator of biological productivity, such as chlorophyll.

2. Physical and Chemical Aspects

79C-0891
HYDROCARBONS IN THE WESTERN NORTH ATLANTIC SURFACE SEDIMENTS
Farrington, J.W., and B.W. Tripp. 1977.
Report WHOI-CONTRIB-3894, NSF/IDOE-78-17, Grants NSF-GX-35212, NSF-GX-28334. 16 p.

Hydrocarbons, Petroleum products, Fate, Sediments, Movement, Atlantic Ocean, *New York Bight

Fossil fuel hydrocarbons are the bulk of hydrocarbons in and near the New York Bight dump site area. Concentrations of hydrocarbons at the edge of the continental shelf as well as in sediments in the abyssal plain surface sediments suggests and documents transport of land derived organic matter to deep ocean areas. Details on composition, site location, and study procedures are provided.

[from Government Reports Announcements 78(13):143. #PB-278 423. 1978]

79C-0892
AN EVALUATION OF OIL AND GREASE CONTAMINATION ASSOCIATED WITH DREDGED MATERIAL CONTAINMENT AREAS
White, C.T. 1977.
Report WES-TR-D-77-25, Contract DACW39-75-C-0125. 153 p. Final report.

Sediments, Concentrations, Water quality, Petroleum products, *Dredging

The title study analyzed water and sediment samples taken in six dredging containment areas. Results indicated that oil and grease are not released from sediments to any significant extent during the dredging process. Bench scale investigation indicated that oil and grease concentrations in the water phase were quite low even with dredging of particularly oily sediments.

[from Government Reports Announcements 78(7):171. #AD-A048 566. 1978]

3. Social and Economic Aspects

79C-0893
THE SOCIAL BENEFIT/COST ANALYSIS OF OFFSHORE DRILLING. COMMENTARY AND RESPONSE. DISCUSSION
Mead, W., E.J. Cahill, D.W. Gaskins, Jr., R. Knecht, et al. 1976.
The Question of Offshore Oil. E.J. Mitchell (ed.). Washington, DC, American Enterprise Institute for Public Policy Research, 1976. p. 67, 69-92.

Socioeconomic effects, Cost analysis, Economics, Onshore impacts, Oil spills, Santa Barbara Channel

The social cost of the 1969 Santa Barbara oil spill was $16.4 million, far less than the value of the oil found. It was urged that government regulations to prevent oil spills be subjected to similar cost/benefit analyses. There was disagreement over the adequacy of the social cost measurement, and the need for state management programs for dealing with onshore impacts of offshore drilling was pointed out.

[from Petroleum Abstracts 19(1):#257,807. 1979]

4. Environmental Response and Recovery

79C-0894
EXPERIMENTAL OILSPILLS GENERAL PLAN
Environment Canada. 1979.
Environmental Protection Service, Environment Canada. 83 p.

Oil spills, Environmental effects, Ice, Cold climates, Canada

This document describes an integrated program of five "core" studies involving experimental oil spills. The objective of the program is to provide data necessary for improved response to arctic marine oil spills. The first experimental spill will be during the summer of 1980.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0895
FERTILIZING AND SEEDING OIL-DAMAGED ARCTIC TUNDRA TO EFFECT VEGETATION RECOVERY PRUDHOE BAY, ALASKA
McKendrick, J.D., and W.W. Mitchell. 1978.
Arctic 31(3):296-304.

Crude oil, Vegetation, Soil, Toxicity, Recovery, Chronic effects, Alaska *Tundra

Vegetation recovery was studied for 6 growing seasons following a spill of 22° API gravity Prudhoe Bay crude with diesel and heating oil fractions removed. Nitrogen and potassium fertilizers used alone or together did not improve growth of either resident or seeded plant species. A more significant response was to phosphorus.

5. Baseline and Environmental Impact Studies

79C-0896
CANADIAN OFFSHORE REPORT: ENVIRONMENTAL HAZARDS EXTENSIVE FOR DRILLING IN LANCASTER SOUND
Anon. 1978.
Oilweek 29(21):20, 22, 24.

EIS, Offshore, Drilling, Ice, Cold climates, Blowouts, Canada, *Lancaster Sound

An Institute of Ocean Sciences report has found that icebergs represent the major threat to offshore drilling in Lancaster Sound and a blowout is the major threat to marine life in the area. The report, written by A.R. Milne and B.D. Smiley, is the main component of an EIS to be submitted by the Department of Indian and Northern Affairs to an environmental assessment and review panel.

[from Petroleum Abstracts 19(8):#259,682. 1979]

79C-0897
MEETING A MEASUREMENT CHALLENGE IN ALASKA
Anon. 1977.
Dimensions-NBS 61(1):6-9.

Baseline studies, Trans-Alaska Pipeline, Oil transport, Analytical techniques, Hydrocarbons, Gulf of Alaska

Natural levels of hydrocarbons around Valdez, Alaska were measured to gather baseline data in the area expected to receive the brunt of tanker activity from the Alaskan pipeline. Dynamic headspace sampling, a quantitative technique that allows large-scale measurement of hydrocarbons, was adapted for the Prince William Sound area.

[from Environment Abstracts 7(9):#77-04574. 1977]

79C-0898
ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS: EFFECTS ON LIVING RESOURCES AND HABITATS
Clark, J., and C. Terrell. 1978.
US Fish and Wildlife Service Report FWS/OBS-77/14, Vol. 3. 220 p.

OCS, Oil-gas leasing, Offshore, Development, Fish, Wildlife, Habitats, Oil transport, Environmental effects

Methods of assessing the effects of OCS development on fish and wildlife resources and their supporting ecosystems are outlined. Offshore recovery operations, onshore facilities development, and the transport of raw and processed hydrocarbons are examined.

[from Environmental Abstracts 8(7/8):#78-03937. 1978]

79C-0899
STRATEGIC PETROLEUM RESERVE. SEAWAY GROUP SALT DOMES. VOLUME I. BRYAN MOUND EXPANSION, ALLEN, DAMON MOUND, NASH, WEST COLUMBIA
Federal Energy Administration. 1977.
Report FEA/S-77/344, DES-77/10-VOL1-1. 366 p. Draft environmental impact statement.

EIS, Strategic Petroleum Reserve, Crude oil, Storage, Environmental effects, Texas

This document is a site specific EIS for five candidate sites from the Seaway Group located in the Gulf coast region of southeastern Texas. It analyzes the environmental impacts which could occur during site preparation and operation of oil storage facilities at each of the five locations.

[from Government Reports Announcements 78(3):221. #PB-274 132. 1978]

79C-0900
STRATEGIC PETROLEUM RESERVE. SEAWAY GROUP SALT DOMES. VOLUME II. APPENDICES A AND B
Federal Energy Administration. 1977.
Report FEA/S-77/345, DES-77/10-VOL-2. 321 p. Draft environmental impact statement.

EIS, Strategic Petroleum Reserve, Crude oil, Storage, Environmental effects, Texas

Volume 2 of the draft EIS contains a description of the project and a description of the environment.

[from Government Reports Announcements 78(3):221. #PB-274 133. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0901
STRATEGIC PETROLEUM RESERVE. SEAWAY GROUP SALT DOMES. VOLUME III. APPENDICES C-J
Federal Energy Administration. 1977.
Report FEA/S-77/346, DES-77/10-VOL 3. 362 p. Draft environmental impact statement.

EIS, Strategic Petroleum Reserve, Crude oil, Storage, Environmental effects, Texas

Volume 3 of the draft EIS describes the impacts which the project may have on the environmental setting described in Appendix B.

[from Government Reports Announcements 78(3):221. #PB-274 134. 1978]

79C-0902
STRATEGIC PETROLEUM RESERVE. TEXOMA GROUP SALT DOMES. WEST HACKBERRY EXPANSION, BLACK BAYOU, VINTON, BIG HILL. VOLUME I.
Federal Energy Administration. 1977.
Report FEA/S-77/347, DES 77/8-VOL-1. 387 p. Draft environmental impact statement.

EIS, Strategic Petroleum Reserve, Crude oil, Storage, Environmental effects, Louisiana, Texas

The title document is a site specific EIS for 4 proposed candidate sites from the Texoma group of salt domes located in the Gulf Coast region of southwestern Louisiana and southeastern Texas. This EIS analyzes the environmental impacts caused by site preparation and operation at each of the four locations.

[from Government Reports Announcements 78(3):221. #PB-274 182. 1978]

79C-0903
STRATEGIC PETROLEUM RESERVE. TEXOMA GROUP SALT DOMES. WEST HACKBERRY EXPANSION, BLACK BAYOU, VINTON, BIG HILL. VOLUME II. APPENDICES A AND B
Federal Energy Administration. 1977.
Report FEA/S-77/348, DES-77/8/-VOL-2. 443 p. Draft environmental impact statement

EIS, Strategic Petroleum Reserve, Crude oil, Environmental effects, Storage, Louisiana, Texas

Appendices A and B contain the description of the project and the description of the environment.

[from Government Reports Announcements 78(3):222. #PB-274 183. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0904
STRATEGIC PETROLEUM RESERVE. TEXOMA GROUPS SALT DOMES. WEST HACKBERRY EXPANSION, BLACK BAYOU, VINTON, BIG HILL. VOLUME III. APPENDIX C
Federal Energy Administration. 1977.
Report FEA/S-77/349, DES-77/8-VOL-3. 427 p. Draft environmental impact statement.

EIS, Strategic Petroleum Reserve, Crude oil, Environmental effects, Storage, Louisiana, Texas

Volume III contains appendix C which examines the environmental impacts of alternative actions.

[from Government Reports Announcements 78(3):222. #PB-274 184. 1978]

79C-0905
STRATEGIC PETROLEUM RESERVE. TEXOMA GROUP SALT DOMES. WEST HACKBERRY EXPANSION, BLACK BAYOU, VINTON, BIG HILL. VOLUME IV. APPENDICES D-S
Federal Energy Administration. 1977.
Report FEA/S-77/350, DES-77/8-VOL-4. 652 p. Draft environmental impact statement.

EIS, Strategic Petroleum Reserve, Crude oil, Environmental effects, Storage, Louisiana, Texas

Volume IV contains appendices D-S which deal with environmental criteria not discussed in the previous 3 volumes.

[from Government Reports Announcements 78(3):22. #PB-274 185. 1978]

79C-0906
STRATEGIC PETROLEUM RESERVE: SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENTS FOR WEEKS ISLAND/COTE BLANCHE MINES
Federal Energy Administration. 1977.
Report FEA-7677, FES-76/77-8. 256 p.

EIS, Strategic Petroleum Reserve, Crude oil, Storage, Environmental effects, Louisiana

This site-specific EIS supplement analyzes the environmental impacts caused by site preparation and operation of the proposed St. James oil distribution system and compares these impacts with those of the barge distribution system considered in the Final EIS's.

[from Government Reports Announcements 78(11):152. #FEA/S-77/228. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0907
STRATEGIC PETROLEUM RESERVE. DRAFT ENVIRONMENTAL IMPACT STATEMENT. VOLUME III. APPENDIX C. WEST HACKBERRY EXPANSION, BLACK BAYOU, VINTON, BIG HILL
Federal Energy Administration. 1977.
Report FEA/S-77/323. 432 p.

EIS, Strategic Petroleum Reserve, Crude oil, Storage, Environmental effects, Texas

This volume contains a detailed evaluation of potential environmental impacts associated with construction and development of the four title sites. Discussion of impacts associated with alternative facility components is provided.

[from Energy Research Abstracts 3(10):#23059. 1978]

79C-0908
PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET GROUND AREA. A PILOT DESIGN STUDY
Jenkins, R.G., L.S. Ramos, and V.D. Henry. 1977.
Report NOAA-TM-ERL-MESA-8, EPA/600/7-77/098. 64 p. Final report.

Hydrocarbons, Baseline studies, Oil transport, Chromatography, Ports, Puget Sound

This study provides the basis for development of the hydrocarbon baseline data needed to assess potential tanker contamination. Sediments and bottom dwellers were studied in the Port Angeles and Dungeness Bay areas of the Sound. Various concentrations of several hydrocarbons are discussed. Silica gel chromatography and glass capillary GC were used to identify the samples. Seventeen aromatic hydrocarbons are proposed for baseline monitoring.

[from Government Reports Announcements 78(4):194. #PB-274 591. 1978]

79C-0909
TUMORS AND MICROBIAL DISEASES OF MARINE FISHES IN ALASKAN WATERS
McCain, B.B., W.D. Gronlund, M.S. Myers, and S.R. Wellings. 1979.
Journal of Fish Diseases, Vol. 2:111-130.

Baseline studies, Fish, Carcinogens, Health hazards, OCS, Alaska, Bering Sea, *Pathology

To evaluate the future impact of oil exploration and production in Alaskan waters on diseases of marine animals, a baseline study was conducted to assess the current health status of demersal fish in the Bering Sea. Of the 26 species examined, four were found to have externally visible abnormalities. The pathologic features and distribution of the lesions is detailed.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0910
IMPACT OF OFFSHORE OIL AND GAS DEVELOPMENT ON THE COASTAL ZONE: REFORMING THE IMPACT ASSESSMENT PROCESS
Mitchell, J.K. 1978.
Coastal Zone Management Journal 4(3):299-327.

EIS, OCS, Oil-gas leasing, Environmental effects, Onshore impacts

The federal EIS process is reviewed in relation to OCS development. "Critical deficiencies include failure to emphasize onshore impacts; insensitivity to spatial variations of impact; neglect of available data; rigid, unsupported assumptions; and preoccupation with short-term effects to the exclusion of more significant and dependent long-term consequences." A number of reforms are suggested.

[from Petroleum Abstracts 19(11):#260,667. 1979]

79C-0911
THE FIRST ENVIRONMENTAL IMPACT MONITORING AND ASSESSMENT IN ANTARCTICA: THE DRY VALLEY DRILLING PROJECT
Parker, B.C., and R.V. Howard. 1977.
Biological Conservation 12(3):163-177.

Baseline studies, Monitoring, Models, EIS, Environmental effects, Antarctica

An environmental impact assessment matrix was developed to estimate the potential impact of the title project. Five recovery time intervals and an impact probability are included in the matrix. Methods of environmental impact monitoring have emphasized the microbiology of air and soil in Antarctica, where there are sparse native soil and water microbial communities.

[from Environment Abstracts 8(1):#78-00289. 1978]

79C-0912
HYDROCARBONS: NATURAL DISTRIBUTION AND DYNAMICS ON THE ALASKAN OUTER CONTINENTAL SHELF
Shaw, D.G. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 13. p. 507-727.

Hydrocarbons, Biogenic hydrocarbons, Distribution, Sedimentation, OCS, Baseline studies, Alaska, Beaufort Sea

Results of hydrocarbon analyses of biota, water, sediment, and seston indicated that the Alaskan OCS was relatively free of petroleum hydrocarbons. Petrogenic hydrocarbons were detected in intertidal sediments of the Beaufort Sea. Investigations of the processes of hydrocarbon transport from the water column to the benthos are described, and brief descriptions of site specific studies are given.

[from Petroleum Abstracts 19(9):#260,087. 1979]

79C-0913

NEARSHORE FISH AND MACROINVERTEBRATE ASSEMBLAGES ALONG THE STRAIT OF JUAN DE FUCA INCLUDING FOOD HABITS OF NEARSHORE FISH
Simenstad, C.A., B.S. Miller, J.N. Cross, K.L. Fresh, and S.N. Steinfort. 1977.
Report NOAA-TM-ERL-MESA-20, NOAA 78021510. 155 p.

Baseline studies, Fish, Marine organisms, Food web, Puget Sound, *Strait of Juan de Fuca

The title baseline study is intended to provide data for documentation of changes in distribution, abundance, and biomass of the nearshore fish in response to potential oil shipment to or through the Strait of Juan de Fuca. Food habits studies and cataloguing of macroinvertebrates will be carried out. Seventy species of demersal fish and one hundred fifteen species of macroinvertebrates were collected.

79C-0914

DEPARTMENT OF ENERGY ENVIRONMENTAL PLANNING PROCESS FOR OIL SHALE TECHNOLOGY
Thomas, H.E., and R. Franklin. 1978.
Annual American Institute of Chemical Engineers Meeting, 71st, Miami Beach, 12-16 November 1978. Preprint No. 40a. 17 p.

Oil shale, Development, Environmental effects, DOE

An overview of the environmental planning being conducted by DOE for oil shale technology development is presented. [possibly oil pollution related]

[from Petroleum Abstracts 19(15):#261,664. 1979]

79C-0915

STRATEGIC PETROLEUM RESERVE, BRYAN MOUND SALT DOME, BRAZORIA COUNTY, TEXAS. FINAL ENVIRONMENTAL IMPACT STATEMENT
US Department of Energy. 1977.
Report DOE/EIS-0001, 222 p. Final Supplement to FEA FES 76/77-6.

EIS, Strategic Petroleum Reserve, Crude oil, Storage, Environmental effects, Texas

This final EIS supplement addresses the impacts of construction and operation of a brine injection well system and a water intake system. It is meant to supplement FES 76/77-6 (Draft EIS Supplement) which addressed the impacts of construction and operation of two types of brine disposal systems and a new water system.

[from Energy Research Abstracts 3(8):#16740. 1978]

79C-0916
COASTAL EFFECTS OF OFFSHORE ENERGY SYSTEMS. AN ASSESSMENT OF OIL AND GAS SYSTEMS, DEEPWATER PORTS, AND NUCLEAR POWERPLANTS OFF THE COAST OF NEW JERSEY AND DELAWARE. VOLUME 2. WORKING PAPERS
US Office of Technology Staff. 1976.
Report No. NP-22013. __ p.

Offshore, Development, OCS, Deepwater ports, Environmental effects, Oil-gas leasing

"The ten working papers included in this document contain background data and detailed analysis for specific findings about the environmental impact of the development of offshore oil and gas, the siting of deep-water ports, and the siting of floating nuclear power plants."

[from Petroleum Abstracts 19(7):#259,443. 1979.

79C-0917
SUMMARIZATION AND INTERPRETATION OF HISTORICAL PHYSICAL OCEANOGRAPHIC AND METEOROLOGICAL INFORMATION FOR THE MID-ATLANTIC REGION
Williams, R.G., and F.A. Godshall. 1977.
Report NOAA-78011611. 307 p. Final report.

Baseline studies, Marine environment, Models, Predictions, Behavior, OCS, Atlantic Ocean, Physical aspects

The title report describes the results of an environmental study of the mid-Atlantic OCS. The surface wind field, which plays an important role in the movement determination of spilled oil and other pollutants, is dealt with in detail. Physical characteristics of water masses particularly relevant to the dispersion and advection of pollutants is discussed, and circulation features are analyzed.

[from Government Reports Announcements 78(8):183. #PB-277 104. 1978]

79C-0918
ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS: EFFECTS ON COASTAL COMMUNITIES
Zinn, J. 1978.
US Fish and Wildlife Service Report FWS/OBS-77/13; Vol. 2. 60 p.

OCS, Oil-gas leasing, Offshore, Development, Ecosystems, Environmental effects, Onshore impacts

Secondary growth effects produced by OCS development, and the ecological impacts that may accompany such growth are examined. Commonly used procedures to forecast OCS development related activities and their effects, including input/output analysis, the Harris Model, and development scenarios, are detailed.

[from Environment Abstracts 8(7/8):78-03936. 1978]

6. Legal and Regulatory Aspects

79C-0919
ANNUAL REPORT FOR THE FISCAL YEAR ENDING MARCH 31, 1977
Anon. 1978.
Fisheries and Environment of Canada Report. 104 p.

Resource management, Government agencies, Canada, Birds, Contamination, Biological effects

Canada's Department of Environment was established in 1971 and centralized the responsibility for environmental quality and protection, and enhancement and promotion of the wise use of renewable resources. Among fiscal year achievements, the Canadian Wildlife Service made a breakthrough in its research on the effects of marine oil on seabirds: small amounts of ingested oil significantly reduced birds' ability to absorb nutrients from food.

[from Environment Abstracts 8(9):#78-04497. 1978]

79C-0920
LIABILITY FOR NORTH SEA OIL POLLUTION
Fitzmaurice, V.E. 1979.
Marine Policy 3(2):105-111.

Legislation, International conventions, Liability, Compensation, North Sea, UK, Norway, Offshore, Development

The author examines three aspects of civil liability legislation thought to be of particular importance relative to damage and cleanup costs associated with North Sea oil pollution: Proof of liability, the protection of property interest, and the availability and adequacy of compensation. These three problems are discussed in terms of the 1976 Convention on Civil Liability for Oil Pollution Damage Resulting from Exploration for and Exploitation of Seabed Mineral Resources and its implications for the laws of the UK and Norway.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

79C-0921
THE WORD'S LARGEST BRACKISH WATER SEA: THE BALTIC SEA IS EXTRA SENSITIVE--IS ALREADY DYING
Anon. 1978.
Scanshore 2(1):3-37.

Oil spills, Wastewaters, Chemical effects, Biological effects, Fate, Baltic Sea

Factors contributing to the serious consequences of oil spills in the Baltic Sea include limited water exchange, cold temperature, and long water renewal period. Wastewater input is causing the sea's acidity to be lowered, possibly affecting the biological life.

[from Petroleum Abstracts 19(5):#258,852. 1979]

79C-0922
ENERGY/ENVIRONMENT II. PROCEEDINGS OF NATIONAL CONFERENCE ON THE INTER-AGENCY R&D PROGRAM (2ND) HELD AT WASHINGTON, D.C. ON JUNE 6 and 7, 1977
Automation Industries, Inc. 1977.
Report EPA/600/9-77/025, Contract EPA-68-01-2934. 514 p.

Environmental effects, Monitoring, Refineries, Wastewaters, Fate, Analytical techniques, Behavior, Development, Pollution control, Health hazards, *Proceedings

Topics include fuel processing, utility and industrial power, extraction and beneficiation, integrated technology assessment, health effects, atmospheric transport and fate, measurement and monitoring, and ecological effects.

[from Government Reports Announcements 78(11):238. #PB-277 917. 1978]

79C-0923
THE EKOFISK BRAVO BLOW OUT
Berge, G. 1977.
International Council for the Exploration of the Sea Report. 126 p.

Ekofisk blowout, Biological effects, Fate, Drift, Hydrocarbons, Distribution, Biodegradation, North Sea

Possible effects of oil from the Bravo blowout on physiology and behavior of the exposed living resources, and the distribution and fate of oil in the marine environment are discussed. The physical environment and drift of the oil are described. Investigations included determination of petroleum hydrocarbons in the water, occurrence and distribution of particulate oil following the blowout, identification of oil-degrading bacteria and fungi, and microbial counts in the Ekofisk area of the North Sea.

[from Environment Abstracts 8(4):#78-02474. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0924
THE WEST-FALMOUTH OIL SPILL: HYDROCARBONS IN THE SALT MARSH ECOSYSTEM
Burns, K.A., and J.M. Teal. 1979.
Estuarine and Coastal Marine Science 8(4):349-360.

Fuel oil, Biological effects, Chronic effects, Recovery, Toxicity, Marshes, Sediments, Massachusetts, *Fundulus

Marsh surface sediments, cores, and organisms were analyzed for hydrocarbons from one to seven years after the September 1969 spill of No. 2 fuel oil at West Falmouth, Massachusetts. Fundulus were nearly free of oil after one year, but Uca remained heavily contaminated for at least four years. Alkanes disappeared in sediments after four years while heavy aromatics persisted throughout the study.

79C-0925
SUMMARY OF THE WORKSHOP ON ECOLOGICAL EFFECTS OF HYDROCARBON SPILL IN ALASKA
Costerton, J.W., G.J. Brunskill, T. Hutchinson, and P. Widden. 1978.
Arctic 31(3):408-411.

Crude oil, Environmental effects, Toxicity, Biodegration, Alaska, *Proceedings

The authors discuss the direction and purpose of papers presented at the title workshop. Categories include studies on oil decomposition, oil toxicity, and discussion of further studies. The studies provide an excellent foundation upon which the development of suitable management policies can be based.

79C-0926
SOME EFFECTS OF OIL ON THE PHYSICAL AND CHEMICAL CHARACTERISTICS OF WET TUNDRA SOILS
Everett, K.R. 1978.
Arctic 31(3):260-276.

Crude oil, Environmental effects, Physical effects, Chemical effects, Soil, Subarctic regions, Alaska, *Tundra

In the title investigation, crude oil hydrocarbons added to wet tundra soil surfaces were studied for three years. With 5 L/m^2 applications, physical and chemical properties were little altered, and water infiltration rates decreased as did plant available cations.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0927
OIL AND GAS IN COASTAL LANDS AND WATERS
Gillman, K. 1977.
Council on Environmental Quality. 153 p.

Development, Environmental effects, Offshore, OCS, Oil-gas leasing, Coastal zone management

This report describes impacts of oil on the coastal zone and attempts to anticipate the effects of new development, and examines means of accomplishing such development with the least harm and the most benefits.

79C-0928
ENERGY TECHNOLOGIES AND NATURAL ENVIRONMENTS: THE SEARCH FOR COMPATIBILITY
Harte, J., and A. Jassby. 1978.
Annual Review of Energy, Vol. 3:101-146.

Environmental effects, Fossil fuels, Oil shale, Risk analysis

The anticipated ecological risks and uncertainties associated with energy sources and what is known about human consequences of ecological degradation from energy activities are examined. Among the energy alternatives discussed are fossil fuels and oil shale. [possibly oil pollution related]

[from Environment Abstracts 9(2):#79-00890. 1979]

79C-0929
AQUATIC POLLUTANTS: TRANSFORMATION AND BIOLOGICAL EFFECTS
Hutzinger, O., L.H. Van Lelyveld, and B.J.C. Zoeteman (eds.). 1978.
Oxford, Pergamon Press, 1978. xiv + 519 p. (Proceeding of the Second International Symposium on Aquatic Pollutants, Amsterdam, 26-28 September 1977)

Sources, Fate, Freshwater, Marine environment, Analytical techniques, Biological effects, *Proceedings

Pollutant sources, analytical methods, transport and degradative processes, and biological effects of pollutants are emphasized. Papers by S.C. Brassell et al., R. Ferrand et al., D. Mackay, and A. Waggot and A.B. Wheatland discuss petroleum pollutants and are abstracted separately in this ussue of OPA.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0930
THE PHYSICAL, CHEMICAL AND BIOLOGICAL EFFECTS OF CRUDE OIL SPILLS ON BLACK SPRUCE FOREST, INTERIOR ALASKA
Jenkins, T.F., L.A. Johnson, C.M. Collins, and T.T. McFadden. 1978.
Arctic 31(3):305-323.

Crude oil, Biological effects, Physical effects, Chemical effects, Soil, Chronic effects, Plants, Mortality, Recovery, Alaska, *Black spruce, *Tundra

Physical, chemical and biological effects of large, hot crude spills on a black spruce site were studied. The area affected by a summer spill was nearly 1.5 times the size of that by a winter spill. Vegetation mortality was virtually complete within areas of surface flows. Generally, deciduous species showed the most rapid injury. Further studies are continuing for chemical changes in oil composition, vegetation recovery, and comparisons of growth rates for oil-affected and control vegetation.

79C-0931
OIL POLLUTION - 'PREVENTION, BEHAVIOUR, CONTROL AND CLEAN-UP'
Kehoe, L. 1979.
New Scientist 81(1148):1023.

Oil transport, Equipment, Legislation, Spill response, Contingency planning, Behavior, Pollution prevention, Pollution control, Dispersants, *Conference

An overview of major themes and research results reported at the 1979 Oil Spill Conference (held on 19-22 March 1979 in Los Angeles) is presented. New procedures for limiting operational pollution from tankers appear promising, superfund legislation has been proposed, and governmental and industry contingency planning to assure swift spill response is progressing. Water-based dispersants may minimize the environmental damage associated with hydrocarbon-based dispersants. A new mechanical method for spill control involves use of an air jet boom to direct a slick toward a skimmer.

79C-0932
THE AFTERMATH OF THE *HOWARD STARR* OIL SPILL
Lewis, R.R. 1979.
Florida Scientist 42 (Supplement):26. Abstract.

Oil spills, Environmental effects, Ecosystems, Plants, Invertebrates, Remote Sensing, *Mangrove forests

On 5 October 1978, the vessel *Howard Starr* discharged 150,000 L (567,750 gal) of bunker C and diesel oil into Hillsborough Bay, Florida. Mangrove forests were impacted, and localized invertebrate mortalities (*Melongena corona*, *Laeonereis culveri*) were observed within 72 hrs of of the spill. Death of oiled mangroves did not begin until 3 weeks after the spill. The 12 month post-spill investigation will include analysis of vertical false color infrared photography of the oiled forests at 6 month intervals. Preliminary results are discussed in relation to other oil-impacted mangrove forests in Puerto Rico and the US Virgin Islands.

79C-0933
SCOTTISH POLLUTION [letter to the editor]
Makepeace, M. 1979.
New Scientist 81(1146):890.

Environmental effects, Beaches, Ballast, Oil terminals, Tankers, Oil discharges, Scotland, *Shetland Islands

Concern is expressed by a Scottish environmental group about "recent widespread increases in apparently small-scale oil pollution incidents, which are causing an insidious buildup of oil on all the beaches including those on such isolated islands as Fair Isle and Sule Skerry." Inadequate ballast water treatment facilities at the Sullom Voe oil terminal and intentional discharges by unscrupulous tanker operators are blamed for the noted increases in pollution.

79C-0934
OIL PERSISTENCE IN TUNDRA AND ITS IMPACT ON THE BELOWGROUND ECOSYSTEM. PROGRESS REPORT, JUNE 1, 1975 - MARCH 1, 1976
Miller, O.K., Jr. 1976.
Report No. ORO/4940-1. 146 p.

Fate, Crude oil, Soil, Arctic, Bacteria, Fungi, Plants, Environmental effects, Chronic effects, *Tundra

The rate of oil penetration into tundra soil and the subsequent changes in soil morphology, soil constituents, higher plant root physiology, total soil respiration, and bacterial and fungal populations were measured following application of Prudhoe Bay crude oil to experimental plots. A natural seep site and two old oil spill sites were also sampled to provide data on long-term effects of oil spills.

[from Petroleum Abstracts 19(1):#257,808. 1979]

79C-0935
OIL PERSISTENCE IN TUNDRA AND ITS IMPACT ON THE BELOWGROUND ECOSYSTEM. PROGRESS REPORT, JUNE 1, 1976 - MARCH 1, 1977
Miller, O.K., Jr. 1977.
Report No. ORO/4940-2. 153 p.

Fate, Crude oil, Soil, Arctic, Physical effects, Chemical effects, Biological effects, Bacteria, Fungi, Plants, Chronic effects, *Tundra

Progress is reported on the title study, in which Prudhoe Bay crude oil was experimentally applied to test plots. A natural seep site and a 30-year-old diesel oil spill site were also sampled to provide insight into the long-term effects of oil in tundra. Results on physical, chemical, and biological changes in the soil are given.

[from Petroleum Abstracts 19(1):#257,809. 1979]

79C-0936
SOME ECOLOGICAL EFFECTS _VENPET-VENOIL_ COLLISION
Moldan, R., P. Chapman, and H.O. Fourie. 1979.
Marine Pollution Bulletin 10(2):60-63.

Oil spills, Environmental effects, Recovery, Chronic effects, Tankers, Africa, *_Venpet-Venoil_ spill

A summary is presented of general findings resulting from pollution monitoring of the _Venpet-Venoil_ tanker collision in December 1977 off South Africa. Over 20,000 tons of Iranian crude and 3,000 tons of bunker oil have damaged several intertidal ecosystems including rocky shores, beaches, estuaries, and sheltered coves. Further studies on the rate of recolonization of cleaned areas will be made.

79C-0937
DESIGN OF FIELD EXPERIMENTS TO DETERMINE THE ECOLOGICAL EFFECTS OF PETROLEUM IN INTERTIDAL ECOSYSTEMS
Moore, S.F., and D.B. McLaughlin. 1978.
Water Research 12(12):1091-1099.

Oil spills, Intertidal zone, Biological effects, Physical effects, Chemical effects, *Experimental design

The experiments are designed to study the effects of oil in the upper rocky intertidal community on species abundance and distribution resulting from the following types of disturbances: 1) Physical/chemical disturbance; 2) direct competition for space; 3) disruption of competition and predation; and 4) interaction with natural processes such as wave exposure and dessication. "A principal outcome of the study is a set of ecological and statistical design criteria to guide the translation of this overall objective into specific experimental designs."

[from Petroleum Abstracts 19(17):#262,263. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0938
REPORT TO THE CONGRESS ON OCEAN POLLUTION, OVERFISHING, AND OFFSHORE DEVELOPMENT - JULY 1975-SEPTEMBER 1976
National Oceanic and Atmospheric Administration. 1977.
Report NOAA-77123004. 59 p. Annual report No. 4.

Environmental effects, Petroleum products, Crude oil, Development, Oil-gas leasing, Marine organisms, Marine mammals

This report focuses on six major areas of research: Studies of the New York Bight, investigations of the relationships of heavy metals and selected marine organisms, experiments on the effects of petroleum on marine mammals, research on the status and effects of overfishing, environmental aspects of deep sea mining, and assessment of the environments of potential offshore oil lease areas.

[from Government Reports Announcements 78(10):189. #PB-277 762. 1978]

79C-0939
DAMAGE ASSESSMENT STUDIES FOLLOWING THE *NEPCO 140* OIL SPILL ON THE ST. LAWRENCE RIVER
Palm, D.J., M.M Alexander, D.M. Phillips, and P. Longabucco. 1979.
Report IERL-Ci-588, Grant No. R805031-01-0. 163 p. Special Study Series.

Environmental effects, Economic effects, Freshwater, St. Lawrence River, Wildlife, Fish, PAH, Marshes, **Nepco 140* spill

This report summarizes the impacts on the economy, the freshwater environment, and the natural resources of the St. Lawrence River resulting from a major spill of No. 6 fuel oil in the Thousand Islands Region on 23 June 1976. Extensive field surveys were conducted within and outside of the impacted area to determine the effects of the oil and the PAHs on marshland, fish, and wildlife. Economic impacts of the spill are summarized in terms of direct economic impact experienced by residential, commercial, and other classes of riparian property owners.

79C-0940
THE RISK OF MINERAL HYDROCARBON POLLUTION IN CEBU HARBOR: A REVIEW OF PERTINENT LITERATURE
Ran, N. 1978.
Philippine Journal of Science, Vol. 14:1-17.

Risk analysis, Contamination, Harbors, Bibliographies, *Literature review

"A review with 78 references."

[from Chemical Abstracts 89(16):#135315q. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0941
POLICIES IN POLLUTION, AQUACULTURE AND COASTAL MANAGEMENT IN JAPAN
Sakiyama, T. 1979.
Marine Policy 3(1):20-39.

Coastal waters, Contamination, Ships, Tankers, Oil discharges, Japan, Coastal zone management

This assessment of the title policies includes a discussion of pollution of coastal waters which indicates that oil is the predominant source of pollution. The Seto Inland Sea, Ise Bay and Tokyo Bay are the most heavily polluted, and the most common source of oil pollution is oil discharged from ships and tankers.

79C-0942
PROJECT DEVELOPMENT AND TECHNICAL DEVELOPMENT PLAN. NEW YORK BIGHT PROJECT
Science Applications, Inc. 1977.
Report NOAA-77112802, Contract NOAA-03-7-022-35105. 229 p.

Contamination, Fate, Environmental effects, Wastewaters, New York, *New York Bight

Details are presented on the New York Bight project, the overall goals of which are to develop a comprehensive understanding of the processes and interrelationships of the ecosystem and to determine the fate and effects of pollutants and other man-related stresses on the New York Bight. Future development and alternative schemes for existing waste disposal strategies are discussed.

[from Government Reports Announcements 78(8):182. #PB-276 014. 1978]

79C-0943
THE IMPACT OF OIL ON THE FRESHWATER ENVIRONMENT. PROCEEDINGS OF A WORKSHOP ON CANADIAN RESEARCH PRIORITIES, CANADA CENTER FOR INLAND WATERS, BURLINGTON, ONTARIO, OCTOBER 20-22, 1976
Scott, R.F., and D. Mackay (eds.). 1976.
Ontario, University of Toronto, Institute of Environmental Studies, 1976. 97 p.

Freshwater, Environmental effects, Canada

Summary not available.

[from Chemical Abstracts 89(11):#85626u. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0944
GENERAL ECOLOGICAL ANALYSIS OF THE DEVELOPMENT OF CHEMICAL PRODUCTION ALONG THE BALTIC SEA COAST [in Russian]
Tsygankov, A.P. 1978.
Khimicheskaya Promyshlennost (Moscow), No. 5:341-345.

Environmental effects, Industries, Petroleum products, Oil shale, Production, Extraction, Discharges, Pollution control, Baltic Sea

Pollution of the Baltic Sea by the discharge of petroleum products, chemicals, heavy metals and other toxic substances is assessed. Problems of pollution related to the oil shale distillation industry and measures to minimize the pollution are discussed.

[from Chemical Abstracts 89(18):#152202t. 1978]

79C-0945
RESEARCH SUMMARY - OIL SPILLS
US Environmental Protection Agency. 1979.
US Environmental Protection Agency, Office of Research and Development, Report EPA-600/8-79-007. 15 p.

Pollution prevention, Pollution control, Oil spills, Spill cleanup, Environmental effects, EPA, *Research summary

This pamphlet summarizes oil pollution related research projects performed by or through the various EPA laboratories or offices. The publication is available from the Research Summary Editor, Office of Research and Development, RD-674, US Environmental Protection Agency, Washington, DC 20460.

79C-0946
THE EKOFISK ACCIDENT: ITS ENVIRONMENTAL AND POLITICAL IMPLICATIONS
Wallenberg, B. 1977.
OECD Observer, No. 88:9-12.

Ekofisk blowout, Fate, Biological effects, International agreements, North Sea

Between 15,000-21,000 tons of oil spilled after the blowout on the Bravo Platform on 22 April 1977. An estimated 50% of the oil evaporated, and only 800-1,000 tons were recovered with mechanical equipment. Preliminary investigations indicate no short-term damage, possibly due to the relatively low level of biological activity in that part of the North Sea at that time of year. The 1969 Bonn Agreement, which promotes cooperation on the problem of oil pollution in the North Sea, is discussed in light of the Ekofisk incident.

[from Environment Abstracts 8(4):#78-02453. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

79C-0947
INTRODUCTION TO MARINE POLLUTION CONTROL
Williams, J. 1979.
New York, John Wiley & Sons, 1979. xiv + 173 p.

Sources, Environmental effects, Pollution control, Fate, Models, Legislation, Cost analysis, Resource management

Topics covered in this book include sources of marine pollutants, effects of pollution, pollution control strategies, pollutant dispersion and transport processes, and legal and economic aspects of pollution control management. Oil pollution is considered throughout.

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

79C-0948
STIMULATED PETROLEUM BIODEGRADATION
Atlas, R.M. 1977.
CRC Critical Reviews in Microbiology 5(4):371-386.

Biodegradation, Microorganisms, Land farming, *Fertilization

Various methods are described for increasing the rates of petroleum biodegradation. Physical and chemical means include removal of particular fractions of the petroleum pollutants. Modification of environmental parameters by fertilization and forced aeration has proven most effective.

[from Petroleum Abstracts 19(7):#259,434. 1979]

79C-0949
CRUDE OIL BIODEGRADATION IN ARCTIC TUNDRA PONDS
Bergstein, P.E., and J.R. Vestal. 1978.
Arctic 31(3):158-169.

Biodegradation, Crude oil, Fertilization, Freshwater, Arctic, *Tundra

Isolated subponds were treated with oil and/or oleophilic or inorganic phosphate fertilizers in an attempt to enhance the degradation of the oil by indigenous microflora. Oil alone did not exhibit stimulatory or toxic effects, while oleophilic phosphate, added in weekly doses, significantly stimulated the microflora in the presence or absence of oil. It was concluded that oleophilic fertilizers may provide a useful tool to enhance the biodegradation of crude oil spilled in oligotrophic waters.

79C-0950
RESISTANCE OF BACTERIAL CHEMOTAXIS TO BLOCKAGE IN PETROLEUM WATERS
Britton, G., D.A. Chuckran, I. Chet, and R. Mitchell. 1979.
Marine Pollution Bulletin 10(2):48-49.

Biodegradation, Hydrocarbons, Bacteria, Behavior

The title article describes a study where the chemotactic response of motile hydrocarbon-degrading bacteria living in oil-polluted water were unaffected by the presence of oil hydrocarbons.

D. FATE OF OIL IN THE ENVIRONMENT

79C-0951
DEGRADATION OF HYDROCARBON SLUDGES IN THE SOIL
Cansfield, P.E., and J.G. Racz. 1978.
Canadian Journal of Soil Science 58(3):339-344.

Biodegradation, Soil, Sludge, Crude oil

The accumulation and degradation of heavy petroleum residues in soil was investigated. Residue sludge from crude oil storage tanks was incorporated into field plots of Red River Clay soil in Manitoba, Canada. Plots were periodically sampled, and hydrocarbons were extracted and separated into individual fractions. Results indicate that massive hydrocarbon accumulations due to soil incorporation is unlikely.

[from Environment Abstracts 9(4):#79-02566. 1979]

79C-0952
ECOLOGICAL ASPECTS OF MICROBIAL DEGRADATION OF PETROLEUM IN THE MARINE ENVIRONMENT
Colwell, R.R. and J.D. Walker. 1977.
RCR Critical Reviews in Microbiology 5(4):423-445.

Biodegradation, Microorganisms, Oil spills, Marine environment

Biodegradation of oil in the marine environment is affected by factors such as temperature, salinity and nutrient concentration, the composition of the oil, and the types of microorganisms indigenous to the polluted area. Because of the complex ecological factors involved, microbial seeding of oil spills offers promise mainly for contained spills or lagooned effluent.

[from Petroleum Abstracts 19(7):#259,435. 1979]

79C-0953
CRUDE OIL UTILIZATION BY FUNGI
Davies, J.S., and D.W.S. Westlake. 1979.
Canadian Journal of Microbiology 25(2):146-156.

Biodegradation, Crude oil, Fungi, Soils, Canada, Hydrocarbons, *n-Alkanes

Oil-degrading fungi were isolated from both oil-polluted and uncontaminated northern Canadian soils using a stationary enrichment technique. Twenty-eight of the 40 fungal cultures were capable of growing on one or more types of crude oils, dependent in part on the chemical composition of oil. Presence of n-alkanes increased the biodegradability of oils by fungi; however, data are presented which show that ability to grow on a pure n-alkane is not a good indicator of ability to grow on crude oil. Problems involved in determining fungal response and the potential of fungi to degrade oil spilled in the environment are discussed.

D. FATE OF OIL IN THE ENVIRONMENT

79C-0954
BIODEGRADATION OF OIL SPILLS [in Spanish]
Didyk, M.B., and M. Costa. 1978.
Boletin Tecnico Arpel 7(2-3):25-30.

Biodegradation, Spill cleanup, Bacteria, Performance testing

Application of cultivated bacteria (Petrobrac I) as a method for oil spill cleanup was tested on a spill in the Loncura coastal area in 1977. The degradation process was enhanced: 60% of the oil was removed in 200 hr. The efficiency of cleanup was observed to be superior to that of other cleanup methods.

[from Petroleum Abstracts 19(13):#261,199. 1977]

79C-0955
THE MICROBIAL DEGRADATION OF AROMATIC PETROLEUM PRODUCTS
Gibson, D.T. 1977.
Report 16-1938-4, Contract N00014-76-C-0102. 13 p. Final report.

Biodegradation, Fate, Aromatic hydrocarbons, Microorganisms, Metabolism, *Pseudomonas Pxy, *Beijerinckia

The way in which Pseudomonas oxidizes aromatic hydrocarbons is presented in detail. Pathways are proposed for the degradation of para- and meta-xylene isomers. Further metabolic processes are discussed as well as oxidation processes carried out by a mutant strain of Beijerinckia.

[from Government Reports Announcements 78(4):64. #AD-A047 092. 1978]

79C-0956
MICROBIAL TRANSFORMATIONS OF AROMATIC POLLUTANTS
Gibson, D.T. 1977.
International 2nd Symposium on Aquatic Pollutants, Amsterdam, 26-28 September 1977. p. 187-204.

Biodegradation, Aromatic hydrocarbons, Microorganisms

The use of laboratory studies to determine the biodegradability of certain classes of aromatic compounds is examined. [possibly oil pollution related]

[from Environment Abstracts 9(2):#79-00873. 1979]

D. FATE OF OIL IN THE ENVIRONMENT

79C-0957
PETROLEUM-OXIDIZING MICROFLORA OF THE USSR ARCTIC SEAS [English summary]
Gusev, M.V., T.V. Koronelli, O.Y. Sentsova, and S. Stoeva. 1978.
Microbiology 47(4):762-764.

Biodegradation, Microorganisms, Bacteria, Arctic, USSR, **Myobacterium sp.*

Active petroleum-oxidizing microorganisms of the Arctic were identified and characterized; they are represented by two Myobacterial groups, the colorless *Myobacterium mucosum*, and the red-orange *M. phlei* and *M. brevicale*. The pigmented forms are characteristic of the deep or benthic waters, the colorless forms are typically surficial.

79C-0958
AQUATIC PETROLEUM-OXIDIZING ARTHROBACTERIA [English summary]
Koronelli, T.V., V.E. Golimbet, N.A. Ushakova, and B.V. Rozynov. 1978.
Mikrobiologiya 47(3):501-504.

Biodegradation, Hydrocarbons, Rivers, Freshwater, Bacteria, **Arthrobacter sp.*

Eight petroleum-degrading *Arthrobacter* strains from the Yenisei River were identified as *A. ceroformans* by morphology and standard biochemical tests. In a medium containing hexadecane, the bacteria formed predominantly cetyl palmitate, and $C_{18:1}$ was the next most abundant hydrocarbon species formed.

[from Chemical Abstracts 89(17):#142944x. 1978]

79C-0959
EFFECT OF SURFACE APPLIED CRUDE OIL ON SOIL AND VASCULAR PLANT ROOT RESPIRATION, SOIL CELLULASE, AND HYDROCARBON HYDROXYLASE AT BARROW, ALASKA
Linkins, A.E., R.M. Atlas, and P. Gustin. 1978.
Arctic 31(3):355-365.

Biodegradation, Crude oil, Biological effects, Soil, Plants, Alaska

Data from the title study suggest that "Tundra soil microbiota can actively modify oil and can utilize it to support metabolism." Higher respiration rates in oiled soils than in control soils suggest that soil microbiota degrade and utilize oil faster than the normal residual plant material.

D. FATE OF OIL IN THE ENVIRONMENT

79C-0960

INVESTIGATIONS ON HYDROCARBON-DIGESTING MICROORGANISMS FROM BALTIC SEA SEDIMENTS [English summary]

Maciejowska, M. 1978.
Acta Hydrochimica et Hydrobiologica 6(3):235-243.

Biodegradation, Sampling, Hydrocarbons, Fuel oil, Microorganisms, Bacteria, Fungi, Sediments, Baltic Sea

"Some 81 strains of bacteria and 26 strains of fungi were recovered by incubation of sediment samples from 5 stations in the Baltic Sea with seawater media containing a hydrocarbon mixture as sole C source. In a 70-day incubation, *Penicillium lanoso-griseum* and a *Mucor* species degraded about 80% of a mixture of C_{14}, C_{16}, and C_{18} alkanes with hexadecane, the shorter compounds being degraded more rapidly and completely. Heating oil was degraded more slowly (~40% in 70 days) than the defined mixture. Squalane and C_{24} hydrocarbons were not degraded."

[from Chemical Abstracts 89(15):#125833t. 1978]

79C-0961

DEGRADATION OF HYDROCARBONS BY FUNGUS, *FUSARIUM* SP.

Nair, S., and P.A. Lokabharathi. 1977.
Indian Journal of Marine Science 6(2):173-175.

Biodegradation, Fungi, Hydrocarbons, Petroleum products, Concentrations, Growth, Tar, **Fusarium*

"*Fusarium* species found in tar balls which are products of oil pollution showed no increased growth in varying concentrations of glucose. The *Fusarium* grew best on petroleum hydrocarbons, especially kerosene with optimum growth occurring at 4% concentration."

[from Chemical Abstracts 89(17):#143022g. 1978]

79C-0962

METHOD FOR DEPOLLUTING FRESHWATER AND SALT WATER BODIES FROM CRUDE OIL, PETROLEUM PRODUCTS, AND THEIR DERIVATIVES

Olivieri, R., A. Robertiello, and L. Degen. 1978.
South African Patent 77/5,279

Biodegradation, Microorganisms, Patent

The title method employs compounds containing phosphorus and slow-release nitrogen in a form assimilable by hydrocarbon-metabolizing aquatic microorganisms.

[from Petroleum Abstracts 19(20):#263,055. 1979]

D. FATE OF OIL IN THE ENVIRONMENT

79C-0963
MICROBIAL METABOLISM OF CYCLIC HYDROCARBONS AND RELATED COMPOUNDS
Perry, J.J. 1977.
CRC Critical Reviews in Microbiology 5(4):387-412.

Biodegradation, Microoganisms, Hydrocarbons, Metabolism

Utilization of alicyclic hydrocarbons and substituted and unsubstituted hydrocarbons by microorganisms is reviewed.

[from Petroleum Abstracts 19(7):#259,437. 1979]

79C-0964
BIOLOGICAL PURIFICATION OF POLLUTED BEACH [English summary]
Tagger, S., D. Deveze, and J. LePetite. 1979.
Environmental Pollution 18(4):275-288.

Biodegradation, Hydrocarbons, Refineries, Wastewaters, Beaches, Chronic effects, Recovery, France

"The biodegradation of hydrocarbons in an oil refinery effluent discharge into seawater was studied. In general, the degradation potential of the microflora present in seawater was highest in zones affected by chronic discharges."

79C-0965
PETROLEUM DEGRADATION IN LOW TEMPERATURE MARINE AND ESTUARINE ENVIRONMENTS
Traxler, R.W. 1978.
Report 98-01-4062-4, Contracts N00014-76-C-0138, N00014-68-A-0215-0013. 16 p. Final report.

Biodegradation, Bacteria, Hydrocarbons, Sediments, Cold climates

Results are discussed of investigations using bacteria isolated from several low temperature water and sediment environments. In situ degradation rates were shown to be much lower than laboratory rates. Hydrocarbon metabolizing microorganisms contain inclusions not present in the same organisms grown on peptone.

[from Government Reports Announcements 78(16):116. #AD-A053 952. 1978]

79C-0966
MICROBIAL RELEASE OF OIL FROM SOIL COLUMNS
Vanloocke, R., A.M. Verlinde, W. Verstraete, and R. De Borger. 1979.
Environmental Science and Technology 13(3):346-348.

Biodegradation, Groundwater, Soil, Microorganisms

D. FATE OF OIL IN THE ENVIRONMENT

"The possibility of cleaning up subsurface soil horizons polluted with gas oil by activating microbial processes has been investigated. The results obtained from the laboratory studies indicate that by irrigating the soil with a nutrient solution containing ammonium nitrate and peptone, 10 to 20% of the oil adsorbed in the soil can be recovered in a period of 3 to 4 mo. The release process is biological. The recovered oil is not emulsified and can be recuperated as a phase."

[from Petroleum Abstracts 19(22):#263,636. 1979]

2. Physical and Chemical Processes

79C-0967
GAS CHROMATOGRPAHIC ANALYSIS OF ARGO MERCHANT OIL AND SEDIMENT HYDROCARBONS AT THE WRECK SITE
Hoffman, E.J., and J.G. Quinn. 1979.
Marine Pollution Bulletin 10(1):20-24.

Analytical techniques, Chromatography, Sediments, Tar, Fate, Argo Merchant spill

Contaminated sediments were identified in a 10-15 km^2 section around the wreck site near Nantucket shoals. "The contamination was in the form of small tar particles (or oil droplets) inhomogeneously mixed into the sandy sediments;" lower concentrations in the vicinity of the site "were significantly lower than found on an earlier cruise."

79C-0968
PHYSICAL AND CHEMICAL BEHAVIOR OF CRUDE OIL SLICKS ON THE OCEAN
JBF Scientific Corporation. 1976.
Washington, DC, American Petroleum Institute Publication, 1978. 98 p.
API Publication No. 4290.

Behavior, Oil slicks, Evaporation, Concentrations, Hydrocarbons

Several small deliberate spills of crude oil into the North Atlantic were monitored under various sea conditions for up to two days. The low-molecular-weight hydrocarbons were rapidly lost from the slicks and the petroleum content of the water below the slicks returned to normal levels within a few hours.

[from Chemical Abstracts 89(14):#113475q. 1978]

D. FATE OF OIL IN THE ENVIRONMENT

79C-0969
OIL SPILLS
McGill, W.B. 1978.
Crops and Soils 31(1):6-9.

Land spills, Soil, Biodegradation, Toxicity, Plants

Spills of crude oil on land and the oil's effect on soil, and soil restoration programs, are discussed. The two primary problems caused by oil are the tie-up of nutrients within microbial tissues during oil decompostion and toxicity to plants of the light hydrocarbons in the crude oil.

[from Environment Abstracts 9(1):#79-00283. 1979]

79C-0970
VOLATILIZATION OF POLLUTANTS FROM WATER
Mackay, D. 1978.
Aquatic Pollutants: Transformation and Biological Effects. Proceedings of the Second International Symposium on Aquatic Pollutants, Amsterdam, 26-28 September 1977. O. Hutzinger, L.H. Van Lelyveld, and B.C.J. Zoeteman (eds.). Oxford, Pergamon Press, 1978. p. 175-185.

Oil slicks, Evaporation, Fate, Models

The mechanism of volatilization is reviewed in terms of liquid and vapor phase resistances coupled by the Whitman Two Film Model. Volatilization rates are controlled primarily by Henry's Law constant, the vapor phase mass transfer coefficient, and the liquid phase mass transfer coefficient. [possibly oil pollution related]

79C-0971
SOURCES AND FATE OF AROMATIC COMPOUNDS IN URBAN STORMWATER RUNOFF
MacKenzie, M.J. and J.V. Hunter. 1979.
Environmental Science and Technology 13(2):179-183.

PAH, Sediments, Fate, Crankcase oil, *Stormwater runoff

The presence of PAHs in sediments may be attributed to stormwater runoff from the land. A comparison of hydrocarbon and sulfur fractions indicates that crankcase oil is the most likely source of PAHs in stormwater runoffs.

[from Environment Abstracts 9(4):79-02705. 1979]

D. FATE OF OIL IN THE ENVIRONMENT

79C-0972
FIELD INVESTIGATIONS OF CONVERGENCES AND SLICK CONCENTRATION MECHANISMS IN DELAWARE BAY
Sarabun, C.C. 1977.
Report CMS-RANN-1-77, NSF/RA-770307, Grant NSF-G1-41896. 81 p. (See also report Dec. 76, PB-264 968)

Oil slicks, Crude oil, Movement, Oil industry, Tankers, Delaware Bay

Field studies conducted in Delaware Bay in the channel north of the lightering anchorage are discussed. Significant differences were found between the winter-spring season when only a single front occurs, and the summer-fall when multiple, internal waves appear on a persistent near-surface pynocline. Although the data are not conclusive, some effects of variation in river-flow can be seen.

[from Government Reports Announcements 78(7):176. #PB-275 692. 1978]

79C-0973
THE ROLE OF VOLATILIZATION IN REMOVING POLYCYCLIC AROMATIC HYDROCARBONS FROM AQUATIC ENVIRONMENTS
Southworth, G.R. 1979.
Bulletin of Environmental Contamination and Toxicology 21(4/5):507-514.

PAH, Fate, Carcinogens, *Volatilization

The title study determines the relative volatility of two to five ring PAH structures in water, and examines the importance of the volatilization process in removing PAH from aquatic environments. "While volatilization cannot be anticipated to play an important role in reducing carcinogenic PAH concentrations in aquatic ecosystems, this does not mean that estimated half-lives are measures of their overall persistence in such waters."

79C-0974
DETERMINATION OF THE ATMOSPHERIC CONTRIBUTION OF PETROLEUM HYDROCARBONS TO THE OCEANS
World Meteorological Organization. 1976.
Rome, World Meteorological Organization, 1976. 27 p. WMO Special Environment Report Series. (Unipub ID #SPE 6)

Hydrocarbons, Marine environment, Concentrations, Physical effects, Sea surface, Sampling, Sources, *Atmospheric inputs

Existing knowledge of petroleum hydrocarbons in the marine atmosphere and environment is summarized. Topics covered include the following: Impact of petroleum on physical processes in the marine environment; estimates of atmospheric hydrocarbon levels; strategies for determination of air-to-sea flux of petroleum, sea surface sampling; collection of precipitation; and sampling site selection.

[from Environmental Management 3(2):177. 1979]

D. FATE OF OIL IN THE ENVIRONMENT

79C-0975
THE WEATHERING OF TAR ON BERMUDA
Zsolnay, A. 1978.
Deep-Sea Research 25(12):1245-1252.

Tar, Weathering, Biodegradation, Fate, Oil spills, Tropical regions, Bermuda

"Relative to the fresh, floating incoming tar, sunken tar shows pronounced microbial degradation while tar adhering to the rocky shore shows evaporative loss with less microbial degradation. Surprisingly, normal alkanes with an even carbon number, appear to be more prone to microbial degradation than ones with an odd carbon number."

79C-0976
RELATIONSHIPS BETWEEN AROMATIC HYDROCARBONS AND PELAGIC TAR IN THE MEDITERRANEAN SEA, 1974-75
Zsolnay, A., B.F. Morris, and J.N. Butler. 1978.
Environmental Conservation 5(4):295-298.

Waste, Tar, Aromatic hydrocarbons, Fate, Physical aspects, Mediterranean Sea

The effects of petroleum residues on the amount of aromatic hydrocarbons normally found in the title area were investigated. No relationship between petroleum residues and aromatic hydrocarbon concentrations was found, indicating that the hydrocarbon concentrations are dependent on other factors.

[from Environment Abstracts 9(3):#79-01774. 1979]

3. Models, Simulations, and Predictions

79C-0977
GREENSHORE: OIL SPILL MODEL ENSURES THE BEST POSSIBLE CONTINGENCY PLAN
Anon. 1977.
Scanshore 1(2):64-65.

Models, Spill trajectories, Predictions, Movement, Greenland, *Davis Strait

The Danish Hydraulic Institute has been collecting data for the development of oil spill models in the Davis Strait off Greenland. The West Greenland current pattern is being studied through application of comprehensive measuring programs and statistical methods.

[from Petroleum Abstracts 19(4):#258,389. 1979]

D. FATE OF OIL IN THE ENVIRONMENT

79C-0978
STRACK MODEL TO ESTABLISH OPTIMUM LOCATIONS FOR A DRAIN TO COLLECT OIL POLLUTED GROUNDWATER: AN EXPERIMENTAL AND NUMERICAL EVALUATION
Anon. 1977.
CONCAWE Report 13/77. 47 p.

Models, Groundwater, Contamination, Movement

In comparing experimental results with computer calculations in the title study, several effects were accounted for: Difference in boundary conditions; dispersion and safety margin; sloping of the water table; and amount of flushing. The experimental results are in good agreement with the results of the Strack model calculations when boundary conditions are the same. The Strack model provides an unsophisticated first approach to defining the movement of dissolved hydrocarbons beneath an oil pancake lying on the groundwater table.

[from Environment Abstracts 8(5/6):#78-03372. 1978]

79C-0979
A COMPUTER SIMULATION OF OIL SPILLS
Capehart, B.L., and L.W. Welsh, Jr. 1979.
Simulation 33(2):49-54.

Models, Oil spills, Spill trajectories, Predictions, OCS, Florida

"The discovery and development of oil resources in the Northern Florida Gulf Outer Continental Shelf will ultimately cause oil spills in this area. This study estimates the percentage of the spills that will reach the Florida coast. A computer simulation model incorporating data for seasonal winds, weathering of oil on the sea, and development and transportation of crude oil is presented. Investigations show the effects of both the original location of the spill and the seasonal winds on the frequency with which oil spills reach the coast."

79C-0980
ADVANCEMENTS IN OIL SPILL TRAJECTORY MODELLING
Garver, D.R., and G.N. Williams. 1978.
Oceans 78, 4th Annual Conference, Washington, DC, 6-8 September 1978. Marine Technology Society and Institute of Electrical and Electronics Engineers, 1978. p. 441-444.

Models, Spill trajectories, Oil slicks, Movement, Prediction

Suitable methods for quickly predicting the probable transport path and coastal impact time of a possible oil spill in offshore waters are investigated. In particular, the stochastic trajectory type oil slick simulator was discussed.

[from Environment Abstracts 9(1):#79-00351. 1979]

D. FATE OF OIL IN THE ENVIRONMENT

79C-0981
ECOSYSTEMS DYNAMICS, EASTERN BERING SEA
Laevastu, T., and F. Favorite. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 12. p. 299-341.

Ecosystems, Models, Marine environment, Environmental effects, Bering Sea

A summary review of the Dynamical Numerical Marine Ecosystem Model for the East Bering Sea is given. The model has been useful in assessing the impacts of man's activities on the marine ecosystem. [possibly oil pollution related]

[from Petroleum Abstracts 19(9):#260,085. 1979]

79C-0982
AN INTRODUCTION TO THE OILSPILL RISK ANALYSIS MODEL
Lanfear, K.J., R.A. Smith, and J.R. Slack. 1979.
Offshore Technology Conference, 11th, Houston, Texas, 30 April - 3 May 1979. Vol. 4:2173-2181. No. OTC-3607. Preprint.

Models, Risk analysis, Spill trajectories, OCS, USGS

The computerized model, developed by the USGS for application to OCS lease areas, analyzes the probability of spill occurrence, likely spill trajectories, and locations of vulnerable recreational and biological resources.

[from Petroleum Abstracts 19(21):#263,396. 1979]

79C-0983
SPREADING OIL SLICKS IN A WIND-WAVE CHANNEL
Lin, J.D., and G.S. Campbell. 1977.
Report W78-03962, OWRT-A-059-CONN (2), Contract DL-14-31-0001-5007. 14 p. Completion report, January-September 1977.

Oil slicks, Spreading, Drift, Sea surface

Drift velocities of surface films floating on the water surface under the action of wind-generated waves were investigated in a wind-wave channel using polyethylene sheets. Film drift velocity, wave steepness, drift to shear velocity ratio and air boundary layer interrelationships are discussed.

D. FATE OF OIL IN THE ENVIRONMENT

79C-0984
A STATISTICAL ANALYSIS OF OIL SPILLS IN CANADA
Mackay, D., and A. Wilks. 1978.
University of Toronto/York University Joint Program in Transportation Report #50. 71 p.

Models, Statistics, Oil spills, Predictions, Information systems, Canada

Data on Canadian oil spills from 1968-1975 are summarized. A statistical methodology is proposed for analyzing spill data, determining trends, and predicting future spill frequency and volumes.

[from Environment Abstracts 9(4):#79-02448. 1979]

79C-0985
THE MIXING OF OIL SPILLS INTO THE SEA BY BREAKING WAVES
Naess, A. 1979.
Offshore Technology Conference, 11th, Houston, Texas, 30 April - 3 May 1979. Vol. 4:2193-2204. No. OTC-3610. Preprint.

Models, Oil spills, Dispersion, *Wave action

A theoretical model for the title process is proposed. The model is based primarily on probabilistic methods but is supported by experimental observations and data.

[from Petroleum Abstracts 19(21):#263,395. 1979]

79C-0986
MODELING METHODS FOR PREDICTING OIL SPILL MOVEMENTS
Rath, R.J., and B.H. Francis. 1977.
Report OIW/OCW-7502. 106 p.

Oil spills, Models, Behavior, Drift, Spill trajectories, Sea surface, Predictions

The title study consists of a literature search and 17 representative papers on modeling the surface movement of spilled oil in the marine environment. The study contains an overview of the state-of-the-art of movement prediction using oil spreading and drift models.

[from Government Reports Announcements 78(11):178. #PB-277 669. 1978]

D. FATE OF OIL IN THE ENVIRONMENT

79C-0987
NUMERICAL OIL TRAJECTORY FORCAST MODEL USED TO ASSESS THE HAZARD TO LONG ISLAND BEACHES FROM OIL ENTERING THE NEW YORK BIGHT APEX FROM FEBRUARY 11-24, 1977
Tingle, A., and D. Dieterle. 1977.
Report BNL-50649, Contracts EY-76-C-02-0016. 26 p.

Models, Spill trajectories, Behavior, Drift, New York

A computer model was used to forecast the trajectory of a spill resulting from a barge grounding on the Hudson River. Used to assess the potential danger to Long Island beaches, the model correctly identified the point and time of beaching of the oil.

[from Energy Research Abstracts 2(21):#52797. 1978]

4. General Fate of Oil

79C-0988
THE RELATIVE IMPORTANCE OF EVAPORATION AND BIODEGRADATION, AND THE EFFECT OF LOWER TEMPERATURE ON THE LOSS OF SOME MONONUCLEAR AND DINUCLEAR AROMATIC HYDROCARBONS FROM SEAWATER
Cheatham, D.L, R.S. McMahon, S.J. Way, and J.W. Short. 1977.
Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol. 12, p. 44-65.

Aromatic hydrocarbons, Crude oil, WSF, Evaporation, Biodegradation, Cold climates, Chromatography

A Cook Inlet crude oil WSF, incubated at 5°, 8°, and 12° C, was analyzed by GC during a 96-hr. period to determine the title effects.

[from Petroleum Abstracts 19(9):#260,093. 1979]

79C-0989
NOXIOUS EFFECTS OF DANGEROUS SUBSTANCES IN THE AQUATIC ENVIRONMENT
Commission of the European Communities. 1978.
Commission of the European Communities Report EUR 5983 EN. 594 p.

Hydrocarbons, Petroleum products, Fate, Marine environment, Legislation, Europe

Information on the fate of eight groupings of substances in the aquatic environment is surveyed. The substance groupings include persistent petroleum oils and hydrocarbons. Legislation in the EEC nations to control the discharge of dangerous substances into inland or coastal waters is reviewed.

[from Environment Abstracts 8(11):#78-05824. 1978]

79C-0990

ASSESSMENT AND SIGNIFICANCE OF SEDIMENT-ASSOCIATED OIL AND GREASE IN AQUATIC ENVIRONMENTS

DiSalvo, L.H., H.E. Guard, N.D. Hirsch, and J. Ng. 1977.
Report WES-TR-D-77-26, Contract WESRF-76-86. 154 p. Final report.

Environmental effects, Petroleum products, Toxicity, Microorganisms, Biodegradation, Sediments

A discussion of the term and associated misconceptions of "oil and grease" is given. Although some oil and grease fractions are readily degraded by microbiological action, many hydrocarbons are resistant to decomposition. In certain oil spills, toxic oily residues can be retained for years in sediments with little abatement of the toxic properties.

[from Government Reports Announcements 78(10):179. #AD-A050 044. 1978]

79C-0991

WORLDWIDE STATUS OF RESEARCH ON FATE AND EFFECT OF OIL IN THE MARINE ENVIRONMENT

Gould, H.R., and C.B. Koons. 1978.
Exxon Production Research Company, 1978. 91 p. Special report.

Statistics, Environmental effects, Fate, Behavior, Marine environment

"This report updates the worldwide status of research for 1976, the latest year for which reasonably complete information is available. Its purpose is to identify the research underway, assess its significance, and pinpoint problems requiring additional effort." Topic areas in need of additional work include the following: Fate and effects of oil spill chemicals and chemical-oil mixtures, fate and effects of oil in cold waters; modeling of spill movement and dissipation; and fate and effects of offshore platform discharges (drilling muds, cuttings, deck drainage, and produced waters).

79C-0992

OILSPILL HAS MINIMAL EFFECT ON ENVIRONMENT

Koons, C.B., and R.B. Wheeler. 1978.
Northern Offshore 7(5):24-25

Sources, Statistics, Oil industry, Oil transport, Tar, Distribution, North Sea

D. FATE OF OIL IN THE ENVIRONMENT

Statistics are given to show that the quantity of tar, the most visible form of oil pollution, floating on the surface of the North Sea is small compared to petroleum dispersed in Norwegian waters.

[from Petroleum Abstracts 19(13):#261,198. 1979]

79C-0993
SUSPENDED MATERIAL IN NARRAGANSETT BAY [RHODE ISLAND]: FATTY ACID AND HYDROCARBON COMPOSITION
Schultz, D.M., and J.G. Quinn. 1977.
Organic Geochemistry 1(1):27-36.

Hydrocarbons, Sampling, Chemical analysis, Bays, Rivers, Concentrations, Sediments, Narragansett Bay

Sampling conducted at various stations in Narragansett Bay indicated that the contribution of sewage and other pollutants to suspended matter was greatest in the river stations and decreased from the river stations to the mid and lower Bay stations. Possible sources of these suspended materials and their possible interrelationships with resuspended sediments, sewage effluent, and phytoplankton are discussed.

[from Chemical Abstracts 89(18):#152235f. 1978]

79C-0994
FATE OF CRUDE AND REFINED OILS IN NORTH SLOPE SOILS
Sexstone,A., K. Everett, T. Jenkins, and R.M. Atlas. 1978.
Arctic 31(3):339-347.

Crude oil, Fuel oil, Soil, Fate, Biodegradation, Subarctic regions, Alaska

Prudhoe Bay crude and refined diesel fuel were applied to 5 topographically distinct tundra soils. Penetration depended on soil moisture and drainage characteristics. Biodegradation appeared greatly restricted in drier tundra soils during a one-year exposure. Some light hydrocarbons were recovered from soils one year after spillage while hydrocarbons were still present 28 years after a refined oil spill at Fish Creek, attesting to the persistence of hydrocarbons in North Slope soils.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

1. Biological Aspects

79C-0995
EFFECTS OF OFFSHORE DRILLING WILL BE STUDIED [news brief]
Anon. 1978.
Chemical Engineering 85(11):105.

Offshore, Development, Platforms, Environmental effects, Crude oil, Marine environment, Fish, Microorganisms, Sediments

Southwest Research Institute of San Antonio, Texas has been awarded \$1.9 million by BLM to study the effects of offshore petroleum production on the marine environment. Twenty production platforms off the Mississippi Delta and four control sites will be examined. Ecosystem impacts will be determined from contaminants including drilling muds, trace metals and crude oil. Fish, microorganisms, and sediments will be analyzed.

79C-0996
EFFECTS OF A LIGNOSULFONATE-TYPE DRILLING MUD ON DEVELOPMENT OF EXPERIMENTAL ESTUARINE MACROBENTHIC COMMUNITIES
Tagatz, M.E., J.M. Ivey, H.K. Lehman, and J.L. Oglesby. 1978.
Northeast Gulf Science 2(1):35-42.

Drilling, Exploration, Biological effects, Benthos, Invertebrates, *Drilling muds

Drilling mud was found to affect the composition of estuarine communities developing from planktonic larvae in aquaria containing various mixtures of sand and drilling mud. Mud exposure reduced both numbers of individuals and the frequency of occurrence of macrobenthic species.

79C-0997
EFFECT OF BARITE ($BaSO_4$) ON DEVELOPMENT OF ESTUARINE COMMUNITIES
Tagatz, M.E., and M. Tobia. 1978.
Estuarine and Coastal Marine Science 7:401-407.

Drilling, Biological effects, Benthos, Invertebrates, *Barite, *Drilling muds

"Barite, the primary component of oil drilling muds, affected the composition of estuarine communities developed from planktonic larvae in aquaria containing sand and flowing estuarine water....[The] data indicate that large quantities of this compound, as discharged in offshore drilling, possibly could adversely affect the colonization of benthic animals."

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

2. Physical and Chemical Aspects

79C-0998
GREENSHORE: FIGHTING ICEBERGS
Anon. 1977.
Scanshore 1(2):60-61.

Ice, Drift, Offshore, Drilling, Safety, Oil spills, Models, Greenland, *Davis Strait

During the summer of 1977, the Danish Hydraulic Institute performed an extensive survey on iceberg drift in Davis Strait off Greenland. The data will be used for developing safe offshore drilling activities and for determining the spread of potential oil spills.

[from Petroleum Abstracts 19(4):#258,441. 1979]

79C-0999
CONTRIBUTION OF DIFFERENT SOURCES TO CONTAMINATION OF SURFACE WATERS WITH SPECIFIC PERSISTENT ORGANIC POLLUTANTS
Waggott, A., and A.B. Wheatland. 1978.
Aquatic Pollutants: Transformation and Biological Effects. Proceedings of the Second International Symposium on Aquatic Pollutants, Amsterdam, 26-28 September 1977. O. Hutzinger, L.H. Van Lelyveld, and B.C.J. Zoeteman (eds.). Oxford, Pergamon Press, 1978. p. 141-168.

Sources, Refineries, Wastewaters, Hydrocarbons, Fate, Distribution, *Persistence

Sources and factors affecting the persistence of organic pollutants in surface waters are discussed. Potential pollutant constituents of petroleum refinery wastewaters include naphthalene, xylene, phenols, hydrocarbons, and mercaptans.

3. Social and Economic Aspects

79C-1000
OCS DEVELOPMENT AND ITS ONSHORE IMPACT
Basile, R.J. 1978.
Environmental Comment, February:3-19.

Onshore impacts, Oil-gas leasing, OCS, Socioeconomic effects, Coastal zone management

The US OCS oil and gas development activities can place great pressure on local waterfront communities; related regulations pose new and different problems. How energy-related growth has affected several Louisiana coastal communities from an environmental, land use, and fiscal standpoint, and how offshore exploration in the North Sea could effect offshore activities on US localities, are examined. The political problems of onshore siting decisions and provisions of the Coastal Zone Management Act of 1972 are reviewed.

[from Environment Abstracts 8(4):#78-02464. 1978]

79C-1001
A STUDY OF THE ECONOMIC IMPACT OF TWO PLANNED OFFSHORE OIL PORTS IN THE GULF OF MEXICO, VOLUME 2, ON THE ECONOMY OF SOUTHWEST LOUISIANA. CATEGORICAL IMPACT OF ENERGY PRODUCTION ON SOUTHWEST LOUISIANA
Perrault, A.L, and A. Cartier. 1977.
Report HUD/RES-1316, Contract HUD-H-2196 R. 92 p.

Deepwater ports, Tankers, Environmental effects, Offshore, Economic effects, Gulf of Mexico, Louisiana

This report complements the others in this series of economic projections. Potential environmental degradation as a result of superport development is discussed. Volume 2 inventories the obvious economic impacts in relation to offshore activities.

[from Government Reports Announcements 78(13):190. #PB-278 863. 1978]

4. Legal and Regulatory Aspects

79C-1002
SAFEGUARDING THE ENVIRONMENT
Anon. 1978.
Northern Offshore 7(10):38-39, 42-43.

Legislation, Regulations, Oil industry, Compensation, Solid wastes, Norway

This article summarizes a speech given by G.H. Brundtland, Minister of the Environment, at the OAPEC-NPF Conference. Complaints by fishermen of oil industry littering of the seabed led to underwater investigations and subsequently to strengthened Norwegian regulations concerning ocean dumping and the establishment of a compensation fund for fishermen.

[from Petroleum Abstracts 17(19):#262,765. 1979]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

79C-1003
ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS: REGULATORY FRAMEWORK FOR PROTECTING LIVING RESOURCES
Banta, J.S. 1978.
US Fish and Wildlife Service Report FWS/OBS-77/14, Vol. 4. 126 p.

OCS, Oil-gas leasing, Offshore, Development, Regulations. Government agencies, *US Fish & Wildlife Service

US Fish and Wildlife Service influence on federal decisions relating to environmental protection are explained. Management by this agency of OCS oil and gas and onshore and nearshore development is examined, and the rules and procedures that govern OCS-related operations are assessed.

[from Environment Abstracts 8(7/8):#78-03938. 1978]

79C-1004
PUBLISHED REGULATORY GUIDELINES OF ENVIRONMENTAL CONCERN TO THE OIL INDUSTRY IN WESTEN EUROPE
CONCAWE. 1979.
CONCAWE Report 1/79. 62 p.

Oil industry, Guidelines, Regulations, Environmental effects, Statistics, Europe

Data pertaining to fuel oil sulfur content, gasoline composition, gasoline engine vehicle emissions, pipeline codes, noise control, and effluent water are tabulated for each country in Western Europe. Environmental regulations in Europe relating to the oil industry are included.

[from Environment Abstracts 9(4):#79-02316. 1979]

79C-1005
OPPORTUNITIES TO RESOLVE SOME BASIC CONFLICTS OVER OUTER CONTINENTAL SHELF LEASING AND DEVELOPMENT
General Accounting Office. 1978.
Report EMD-78-39. 14 p.

Oil-gas leasing, Legislation, Regulations, Coastal zone management, Resource management, OCS, Development, *Public participation

This article discusses the contents of two bills (S. 9 and H.R. 1614) that would include revision of OCS leasing processes. Protection and orderly development of the coastal zone is provided for in part by requiring that the planning and management process for OCS leasing and development be opened to public participation.

[from Government Reports Announcements 78(13):188. #PB-278 524. 1978]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENTS, AND PRODUCTION

79C-1006
THE CONFLICT BETWEEN THE FISHING AND THE OIL INDUSTRIES IN THE NORTH SEA - A CASE STUDY
Grant, J.P. 1978.
Ocean Management 4(2-4):137-149.

Oil industry, Fisheries, Resource management, Offshore, Development, North Sea, UK

UK arbitration between the fishing and oil interests in the North Sea is described. Possible conflicts arising from offshore oil operations due to loss of access, hazard to navigation, debris, and pollution are discussed.

[from Environment Abstracts 9(4):#79-02434. 1979]

5. General Aspects

79C-1007
A STUDY OF ENVIRONMENTAL CONCERNS: OFFSHORE OIL AND GAS PRODUCTION
Baker, R. 1978.
Fisheries and Environment of Canada Report EPS 2-EC-78-1. 122 p.

Offshore, Oil-gas leasing, Production, Environmental effects, Safety, Drilling

Most of the identified environmental concerns were associated with production procedures and management systems rather than with hardware systems. The concerns examined included the gradual deposition of pollutants from rigs, underwater pipelines and onshore ancillary structures. Also studied were action plans to deal with oil spills, standards for safety and anti-pollution equipment, information provided on the environmental hazards of offshorre drilling, environmental impact assessments, and communication links between technical and environmental experts and decision-makers.

[from Environment Abstracts 9(2):#79-01034. 1979]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

79C-1008
ECOLOGICAL INVESTIGATIONS OF PETROLEUM PRODUCTION PLATFORMS IN THE CENTRAL GULF OF MEXICO - PRELIMINARY FINDINGS
Bedinger, C.A. 1979.
Offshore Technology Conference, 11th, Houston, Texas, 30 April - 3 May 1979. Vol. 4:2149-2161. No. OTC-3605. Preprint.

OCS, Drilling, Production, Platforms, Chronic effects, BLM, Louisiana, Gulf of Mexico

A program managed by Southwest Research Institute is designed to assess the long-term effects of production platform operations on the OCS environment and to define their artificial reef effect. The study area covers a broad expanse of the Louisiana oil field. Data from the initial sampling and observed trends are given.

[from Petroleum Abstracts 19(21):#263,392. 1979]

79C-1009
AN INDEPENDENT APPRAISAL OF THE OFFSHORE ECOLOGY INVESTIGATION
Bender, E., J.M. Sharp, D.J. Reish, and C.H. Ward. 1979.
Offshore Technology Conference, 11th, Houston, Texas, 30 April - 3 May 1979. Vol. 4:2163-2172. No. OTC-3664. Preprint.

Offshore, Production, Drilling, Biological effects, Physical effects, Chemical effects, Louisiana, *Offshore Ecology Investigation

A series of 23 biological, chemical, physical, and geological studies were performed in the Louisiana oil field under the Offshore Ecology Investigation (OEI) in an effort to detect any long-term effects resulting from 35 yrs of oil and gas drilling and production. An independent evaluation of the OEI was conducted, and the results are presented.

[from Petroleum Abstracts 19(21):#263,391. 1979]

79C-1010
DRILLING FOR OIL IN LANCASTER SOUND, ARCTIC CANADA
Bourne, W.R.P., 1979.
Marine Pollution Bulletin 10(4):97-98.

Development, Drilling, Environmental effects, Wildlife, Liability, Risk analysis, Arctic, Canada, *Lancaster Sound

Concern is expressed about a twelve year exploration contract awarded for activities in Lancaster Sound, alleged to be one of the most important focal points for wildlife in the entire Arctic. The contract, awarded in 1960, fails to adequately recognize blowout risks and does not reflect the liability necessary for those risks.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

79C-1011
WATER MANAGEMENT IN OIL SHALE MINING, VOLUME I. MAIN TEXT
Brown, A., M. Schauer, J.W. Rowe, and W. Haley. 1977.
Report Bu Mines-OFR-2(1)-78, Contracts J0260519. 428 p. Final report.

Oil shale, Environmental effects, Regulations, Wastewaters, Resource management, Models, Colorado

Results are presented of a study of the water management aspects of oil shale mining and retorting in the Piceance Creek Basin, Colorado. Three sites were examined, legal and environmental impacts and constraints identified and discussed, and water management schemes developed in compliance with identified regulations. A computer model was used to simulate the effects of development on the water basin, and mitigation measures recommended.

[from Government Reports Announcements 78(9):125. #PB-276 085. 1978]

79C-1012
WATER MANAGEMENT IN OIL SHALE MINING, VOLUME II. APPENDICES
Brown, A., M. Schauer, J.W. Rowe, and W. Haley. 1977.
Report Bu Mines-OFR2(2)-78, Contract J0265019. 318 p. Final report.

Oil shale, Environmental effects, Resource management, Wastewaters, Regulations, Groundwater, Colorado, Bibliographies

Appendices to the main report include a bibliography, legal and regulatory aspects, inflow analysis and results, computer programs, hydrology information, and related data.

[from Government Reports Announcements 78(9):125. #PB-276 086. 1978]

79C-1013
ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS: REGIONAL STATUS REPORT - PART 4: CALIFORNIA
Corwin, R., and P.H. Heffernan. 1978.
US Fish and Wildlife Service Report FWS/OBS-77/16.4, Vol. 5. 154 p.

OCS, Oil-gas leasing, Environmental effects, Offshore, Development, Santa Barbara Channel, California

Environmental problems in Southern California resulting from OCS leasing and development include the 1969 Union Oil Co. well blowout in the Santa Barbara Channel. Current and potential effects of OCS development on living resources in the region and socioeconomic impacts are reviewed.

[from Environment Abstracts 8(7/8):#78-03942. 1978]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

79C-1014
ADVANCED FOSSIL FUEL AND THE ENVIRONMENT: AN EXECUTIVE REPORT
Dorset, P., D. Myers, T. Parker, and R. Laska. 1977.
Report EPA/600/9-77/013, Contract EPA-68-01-2940. 30 p.

Fossil fuels, Development, Environmental effects

This report provides an overview of some of the more advanced fossil fuel technologies. It includes a discussion of state-of-the-art processes and their environmental impacts which have been or are being investigated. [possibly oil pollution related]

[from Government Reports Announcements 78(4):136. #PB-274 541. 1978]

79C-1015
THE TRANS-ALASKA PIPELINE
Fineberg, R.A. 1977.
Nation 225(10):293-297.

Oil spills, Trans-Alaska Pipeline, Resource management

Through mismanagement in the exploitation of Alaskan oil, construction-related oil and petroleum products spills have amounted to about 2,120,000 L (560,000 gal) despite Alyeska preconstruction pledges to minimize environmental disturbances. Even after completion of construction, an unexpected break in a section of the oil pipe, a pump hose blow-up, and violations in welding codes were added to the pipeline problems. The Alaska Pipeline Commission findings revealed that corporate owners had ignored recommendations that more money be spent for critical planning, cost controls had been poorly planned and ineptly executed, and there had been a lack of cost consciousness.

[from Environment Abstracts 8(3):#78-01776. 1978]

79C-1016
ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS: REGIONAL STATUS REPORTS - PART 2: MID AND SOUTH ATLANTIC
Goodman, J., and P. Klose. 1978.
US Fish and Wilflife Service Report FWS/OBS-79/16.2, Vol. 5. 93 p.

OCS, Oil-gas leasing, Offshore, Development, Environmental effects, Socioeconomic effects, Atlantic coast

Effects of past oil and gas development operations, and possible future effects on coastal living resources for the title region are reviewed. The potential of future OCS development and possible environmental and socioeconomic impacts that may occur if oil is found in marketable quantities are discussed.

[from Environment Abstracts 8(7/8):#78-03940. 1978]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

79C-1017
TRANS-ALASKA OIL PIPELINE - INFORMATION ON CONSTRUCTION, TECHNICAL, AND ENVIRONMENTAL MATTERS THROUGH SPRING 1977
Government Accounting Office. 1977.
Report EMD-77-44. 32 p.

Trans-Alaska Pipeline, Environmental effects, Monitoring, *Construction

Progress of the construction on TAPS, the federal and state monitoring of construction, and certain environmental and technical matters related to the construction are described. Environmental problems, including erosion control, oil spills, and the impact of environmental problems are discussed.

[from Environment Abstracts 8(4):#78-02401. 1978]

79C-1018
ENVIRONMENTAL IMPACTS OF INDUSTRIAL ENERGY SYSTEMS IN THE COASTAL ZONE
Hall, C.A.S., et al. 1978.
Annual Review of Energy, Vol. 3:395-475.

Environmental effects, Coastal zone management, Fate, Sources, Fisheries

Many negative impacts associated with energy facilities in the coastal zone are avoidable with thoughtful planning. Oil and electricity systems are considered. Some of the associated environmental problems discussed are the source and fate of spilled oil, oil's biological effects, release of toxins, and the impact of energy facilities on major fisheries.

[from Environment Abstracts 9(2):#79-01027. 1979]

79C-1019
ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS: REGIONAL STATUS REPORTS - PART 5: ALASKA, WASHINGTON, AND OREGON
Hershman, M.J., and J.H. Feldmann. 1978.
US Fish and Wildlife Service Report FWS/OBS-77/16.5, Vol. 5. 127 p.

OCS, Oil-gas leasing, Offshore, Development, Environmental effects, Onshore impacts, Gulf of Alaska, Oregon, Washington

Topics discussed include environmental and socioeconomic impacts, current status of OCS operations, history of OCS operations, and proposed onshore support site and activities. OCS impacts in the northern Gulf of Alaska, lower Cook Inlet, western Gulf of Alaska, Beaufort Sea, Chukchi Sea, St. George basin, and Norton Basin are detailed.

[from Environment Abstracts 8(7/8):#78-03943. 1978]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

79C-1020
ENVIRONMENTAL ASSESSMENT OF THE BUCCANEER OIL AND GAS FIELD OFF GALVESTON, TEXAS: AN OVERVIEW
Jackson, B., et al. 1978.
Offshore Technology Conference, 10th, Houston, Texas, 8-10 May 1978. Vol. 1:277-285.

Offshore, Oil-gas leasing, Oil fields, Environmental effects, Models, Texas

Preliminary findings of the US NMFS study of environmental conditions at the Shell Oil Co.'s Buccaneer oil and gas field off Galveston, Texas, are presented. Objectives of the investigation were: To identify and document biological, chemical, and physical changes in an oilfield-associated marine ecosystem; to determine quantity, types, and effects of specific pollution; and to develop a descriptive and predictive marine ecosystem model.

[from Environment Abstracts 9(2):#79-01045. 1979]

79C-1021
ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS: REGIONAL STATUS REPORTS - PART 3: GULF COAST
Mumphrey, A.J., Jr., and G.D. Carlucci, Jr. 1978.
US Fish and Wildlife Service Report FWS/OBS-77/16.3, Vol. 5. 158 p.

OCS, Oil-gas leasing, Offshore, Development, Onshore impacts, Environmental effects, Wetlands, Gulf of Mexico

The impacts of OCS development in the Gulf of Mexico on the shrimp, oyster, menhaden, and fur industries, on endangered species and protected habitats, and effects of oil rigs on sport fishing are examined. The major environmental stresses resulting from OCS development include the impacts of channelization and urbanization on the wetlands, the threat of oil pollution from oil spills, and aesthetic and obstructive effects of the placement of platforms and pipelines throughout the Gulf of Mexico.

[from Environment Abstracts 8(7/8):#78-03941. 1978]

79C-1022
MARINE POLLUTION IN KUWAIT
Oostdam, B.L. 1978.
Oceans 78, 4th Annual Conference, Washington, DC, 6-8 September 1978. Marine Technology Society and Institute of Electrical and Electronics Engineers, 1978. p. 445-450.

Crude oil, Development, Socioeconomic effects, Oil spills, Solid wastes, Kuwait

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

The rapid development of crude oil and the resultant industrialization and urbanization has stressed the fragile environment near the Kuwait shoreline. The major pollution hazards are oil spills, industrial wastes, thermal pollution, fecal coliform, and solid waste.

[from Environment Abstracts 9(1):#79-00352. 1979]

79C-1023
A STUDY OF ENVIRONMENTAL BENEFITS OF PROPOSED BATEA AND NSPS EFFLUENT LIMITATIONS FOR THE OFFSHORE SEGMENT OF THE OIL AND GAS EXTRACTION POINT SOURCE CATEGORY
Shore, R., et al. 1977.
EPA Report EPA-440/1-17-011. 375 p.

Environmental effects, Drilling, OCS, Wastewaters, Hydrocarbons, *BATEA, *NSPS

The environmental benefits that would occur from the implementation of Best Available Technology Economically Achievable and New Source Effluent Limitations for the offshore segment of the oil and gas extraction industry are examined. Oilfield brines, which contain toxic oil hydrocarbons and trace metals, are the dominant concern of effluent limitations. BATEA and New Source regulations prohibit discharging produced water into near offshore waters and restrict the oil hydrocarbon content of produced water discharged into far offshore waters.

[from Environment Abstracts 8(7/8):#78-03932. 1978]

79C-1024
PROBLEMS IN THE CONSERVATION OF POLAR MARINE MAMMALS
Siniff, D.B. 1978.
AAAS Selected Symposium Report 7. p. 161-174.

Marine mammals, Resource management, Models, Ecosystems, Arctic

Management problems, population research, the role and value of ecosystem modeling, and aesthetics and recreational considerations in the management of polar marine mammals are examined. Hydrocarbon and mineral exploitation threatens arctic marine ecosystems. Modeling of polar marine ecosystems should proceed initially through a series of species-specific and site-specific process models, with maximum utilization of field investigations and experimentation to update the modeling process.

[from Environment Abstracts 8(10):#78-05599. 1978]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

79C-1025
ENVIRONMENT HAZARDS: CONSIDERATIONS FOR OUTER CONTINENTAL SHELF DEVELOPMENT
Teleki, P.G., L.F. Garrison, and M.A. Hampton. 1979.
Offshore Technology Conference, 11th, Houston, Texas, 30 April - 3 May 1979. Vol. 4:2579-2589. No. OTC-3654. Preprint.

OCS, Development, Oil-gas leasing, Safety, Environmental effects, USGS

"Expansion of offshore petroleum operations into unknown frontier areas, deeper waters, and more hostile environments has increased industry's and government's awareness about environmental hazards on the outer continental shelf (OCS). Data on environmental exposure are absent in the public domain although these data 1) are needed to test engineering concepts for the design of offshore structures, 2) are factors in leasing on the OCS, and 3) govern economic decisions on petroleum exploration and production. The summary of environmental hazards on the U.S. Continental Shelf presented shows much variability in the hazard potential among OCS areas and complex interactions among various types of hazards within a single area."

[from Petroleum Abstracts 19(21):#263,394. 1979]

79C-1026
ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS: REGIONAL STATUS REPORT - PART 1: NEW ENGLAND
Tippie, V., and D. Robadue. 1978.
US Fish and Wildlife Service Report FWS/OBS-77/16.1, Vol. 5. 67 p.

OCS, Oil-gas leasing, Offshore, Development, Environmental effects, Socioeconomic effects, Georges Bank, *New England

The production, development, and potential of OCS oil and gas off New England are examined. No development of oil and gas off New England is presently occurring, though geological surveys indicate that large oil and gas formations exist in the Georges Bank region. Projected social and environmental impacts of OCS development on Georges Bank are weighed.

[from Environment Abstracts 8(7/8):#78-03939. 1978]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

79C-1027
THE SOUTH CHINA SEA - PROSPECTS FOR MARINE REGIONALISM
Valencia, M.J. 1979.
Marine Policy 3(2):87-104.

OCS, Offshore, Development, Production, Tankers, Oil transport, Refining, International agreements, *China Sea, *Marine regionalism

When individual state jurisdiction is extended to 360 km (200 nautical miles), all the South China Sea will fall within national claims. Discussed are numerous possible issues of mutual concern which may give rise to functional marine regionalism, including the issue of environmental protection and transnational pollution prevention and control in offshore oil development, offshore production, tanker transport, and onshore refining.

79C-1028
INTERNATIONAL COMPANIES FIGHT 30,000 BOPD BLOWOUT
Weeden, S.L. 1979.
Ocean Industry 14(7):68, 70, 72.

Blowouts, Pollution control, Spill response, Spill containment, Mexico, *Ixtoc 1 blowout

On 3 June 1979, the Ixtoc 1 well in the Bay of Compeche experienced a blowout, which has resisted all control efforts. Spill response measures included the deployment of Norwegian-built containment booms and skimmers, but containment of the spill oil was hampered by strong surface currents. Environmental damage was said to be minimal.

79C-1029
EFFECTS OF PRODUCED WATERS ON THE MARINE ENVIRONMENT
Weiss, F.T., C.B. Koons, and C.D. McAuliffe. 1977.
Oceans '77 Conference, 3rd Annual Combined Conference, Los Angeles, 17-19 October 1977. Marine Technology Society and Institute of Electrical and Electronics Engineers, 1977. p. 40B-1 - 40B-9. Conference Record, Vol. II.

Wastewaters, Environmental effects, Refining, Marine environment

A review of data now available relative to the composition of waters produced from oil and gas extraction processes, particularly inorganic ions, suggests that "toxic components are present in very low concentrations if at all." Low-level discharges of produced waters do not appear to have significant detrimental effects on the marine environment or biota.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

79C-1030
ENERGY RELATED ACTIVITIES AND AN ASSESSMENT OF THE WATER RESOURCE MANAGEMENT ALTERNATIVES IN SOUTH LOUISIANA
Whitehurst, C.A., and R.A. Kinney. 1976.
Report W-78, 06201, OWRT-C-6052 (5204)(1), Contract DL-14-31-0001-5204.
184 p. Completion report.

Baseline studies, Development, Oil industry, Resource management, Louisiana

The title study discusses water resource management problems brought about by delopment of the oil and gas industry in the upper regions of the Barataria Basin, South Louisiana.

[from Government Reports Announcements 78(16):254. #PB-279 868. 1978]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

1. Tankers and Ships

79C-1031
ALARMING GROWTH IN TANKER CASUALTIES [news brief]
Anon. 1979.
Marine Pollution Bulletin 10(3):68

Tankers, Oil transport, Safety, Regulations, Law enforcement, Liability, International agreements, IMCO

A Sierra Club representative claimed that tanker casualty-introduced oil pollution is "increasing alarmingly" as it tripled between 1974 and 1977, and 1978 was worse than 1977. Shortcomings in IMCO agreements on tanker safety, pollution prevention activities, and new standards and certification were cited as reasons for the increase. The statements were made at a two-day symposium in Georgetown, South Carolina.

79C-1032
POLLUTION CONTROL: A SUMMARY AND FORECAST OF INITIATIVES; US MOVES ON ALL FRONTS TO CUT DOMESTIC/GLOBAL MARINE OIL POLLUTION
Anon. 1878.
Marine Engineering Log 83(6):23-27.

Oil discharges, Mortality, Marine organisms, Regulations, Spill response, International agreements

Pollution from oil spills or shipboard sewage causes disease and death of marine plant and animal life and is expensive to contain and clean up. Most oil discharges, accidental and deliberate, occur during normal ship operation, and are caused by ignorance or negligence of personnel. IMCO agreements, federal regulations, and USCG oil spill response and enforcement capabilities are discussed.

[from Environment Abstracts 8(11):#78-06021. 1978]

79C-1033
ST. LAWRENCE OIL SPILL [news brief]
Anon. 1979.
Marine Pollution Bulletin 10(4):98-99.

Oil spills, Tankers, Fuel oil, Ice, Cold climates, Canada, *Kurdistan spill, *Nova Scotia

Severe weather and collision with ice floes were responsible for the holing and sinking of the tanker Kurdistan near Cape Breton, Nova Scotia. At least 10,000 tons of fuel oil, about one third of the vessel's capacity, is estimated to have escaped.

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1034
A STUDY OF THE COMPARATIVE EFFECTIVENESS OF SOME ALTERNATIVES FOR THE PREVENTION OF MARINE POLLUTION FROM SHIPS
Anon. 1977.
Oil Companies International Marine Forum Report. 30 p.

Tankers, Ships, IMCO, International conventions, Segregated ballast, Pollution prevention

Alternatives for marine pollution control are examined and compared for cost effectiveness. Three alternatives are implementation and enforcement of the 1969 IMCO amendments, employing crude oil washing on all vessels larger than 150,000 dwt, and retrofitting segregated ballast tanks on all vessels larger than 150,000 dwt. The study concludes that first priority should be given to full implementation and enforcement of the IMCO amendments, which set stricter limits on oil discharges.

[from Environment Abstracts 9(3):#79-01792. 1979]

79C-1035
TANKER SAFETY AND POLLUTION PREVENTION - SOME QUESTIONS AND ANSWERS, FACTS AND FIGURES
Anon. n.d.
Oil Companies International Marine Forum Report. 52 p.

Tankers, Safety, Pollution prevention, Segregated ballast, Crude oil washing, IMCO, International conventions, Statistics

The most requested information on marine pollution, tanker safety, and pollution prevention is given. Segregated ballast tankers, retrofitted desegregated ballast tankers, load on top/retention on board, crude oil washing, sludge, and inert gas systems are explained. Information on implementation of the 1969 IMCO amendments and long-term outlook for supply and demand for tanker tonnage is given.

[from Environment Abstracts 9(3):#79-01799. 1979]

79C-1036
CAN PYROPHORIC MATERIALS FORM IN OIL TANKERS WITH INERT GAS FIRE PROTECTION SYSTEMS
Affens, W.A. 1977.
Report NRL-MR-3678, AD-E000 106. 14 p.

Tankers, Safety, *Inert gas systems

A literature study and analysis was made regarding the potential hazard of oil tankers with inert gas systems (IGS). A discussion of the formation of pyrophor materials in an oxygen limited atmosphere (such as IGS or carriers with "sour crude") is given with the conclusion that "in the event of failure of an IGS systems, the ullage space should not be exposed to air suddenly."

[from Government Reports Announcements 78(11):238. #AD-A050 571. 1978]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1037
CRACKING THE TANKER SAFETY PROBLEM
Cameron, J. 1977.
Fortune 95(4):150-152.

Oil spills, Tankers, Ballast, Safety, Personnel training, Pollution prevention

More oil enters ocean waters by ship tank cleaning operations and ballast discharge than by tanker accidents, even though techniques exist to prevent such pollution. There is a pressing need for offshore port facilities, deeper and wider channels, better-qualified pilots, and better electronic equipment to improve safety on inland waters.

[from Environment Abstracts 7(12):#77-06514. 1977]

79C-1038
THE INITIAL POLLUTION OF SHORES IN BANTRY BAY, IRELAND, BY THE TANKER *BETELGEUSE*
Cross, T.F., T. Southgate, and A.A. Myers. 1979.
Marine Pollution Bulletin 10(4):104-107.

Oil spills, Tankers, Environmental effects, Spreading, Spill cleanup, Bays, Ireland, *_Betelgeuse_ spill

The title article discusses spreading and movement, monitoring activities and cleanup operations of an unknown quantity of spilled oil resulting from the 8 January 1979 explosion of the tanker *Betelgeuse* in Bantry Bay, Ireland. Detailed maps of the spreading are provided from 9 January - 13 January 1979. Salvage activities are briefly discussed.

79C-1039
CHRISTOS BITAS - THE FIGHT AT SEA AGAINST POLLUTION
Department of Trade, UK. 1978.
London, UK Department of Trade, 1978. 36 p.

Spill response, Pollution control, Biological effects, Wildlife, Fisheries, Dispersants, UK, *_Christos Bitas_ spill

A detailed chronological account is given of the measures taken to combat oil pollution from the tanker *Christos Bitas*, which was damaged off the coast of South Wales on 12 October 1978. Included is an assessment of the effects on wildlife and fisheries of the 2,400 tons of oil that were spilled, the effectiveness of the dispersant operations, and the effectiveness of response measures taken.

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1040
VALDEZ NARROWS TANKER SIMULATIONS
Devlin, W.M. 1977.
Oceans '77 Conference, 3rd Annual Combined Conference, Los Angeles, 17-19 October 1977. Marine Technology Society and Institute of Electrical and Electronics Engineers, 1977. p. 28-C-1 - 28-C-4. Vol. II.

Tankers, Deepwater ports, Pollution prevention, Safety, Alaska, *Valdez Narrows

Because the severe geographic constraints of the Valdez Narrows, site of passage for all tankers carrying Alaskan crude, safety parameters were examined at the Netherlands Ship Model Basin, Wageningen. Factors studied included wind, speed, rudder casualties, main propulsion casualties, visibility, and the presence or absence of an island in the middle of Narrows. From the evaluation, present and proposed rules governing transit were studied and revisions recommended.

79C-1041
SAFER NAVIGATION IN THE ENGLISH CHANNEL [news brief]
Dixon, T.R. 1979.
Marine Pollution Bulletin 10(4):97.

Tankers, Oil transport, Safety, International agreements, Monitoring, Regulations, English Channel

A ship movement reporting systems (MAREP) has been introduced for the English Channel. With approval by IMCO and the British and French governments, the system is primarily intended for loaded tankers, gas and chemical carriers, or other vessels with restricted maneuverability or defective navigational aids. The system may become mandatory rather than voluntary.

79C-1042
HOW CAN WE SOLVE TANKER SAFETY PROBLEMS
Gearin, L.F. 1977.
Alaska Construction and Oil 18(6):49-52.

Tankers, Safety, Pollution prevention, Personnel training, Regulations, API

Concern over recent tanker accidents has prompted API to reexamine all facets of tanker operations to increase pollution safety precautions. Human error is the primary reason for most navigational accidents. Congress should enact stricter tanker regulations, the USCG should be entrusted with inspection of tankers, and new instrumentation should be required.

[from Environment Abstracts 7(12):#77-06519. 1977]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1043
MARINE APPROACHES TO U.S. PORTS: A FLEXIBLE AND OBSTRUCTION-FREE SYSTEM IS NEEDED
General Accounting Office. 1978.
Report CED-78-107. 17 p.

Tankers, Ships, OCS, Development, Ports

Recommendations are presented to resolve controversy between energy and maritime interests caused by exploration for oil and gas on the OCS. Congressional authorization should be given to the USCG for designation of obstruction-free shipping routes on the OCS, relocation of shipping routes to avoid oil and gas activities, and prevention of OCS development until shipping routes are shifted.

[from Government Reports Announcements 78(17):244. #PB-280 847. 1978]

79C-1044
TANKERS, THE COAST GUARD AND PUBLIC POLICY
Ide, J.C. 1977.
Oceans '77 Conference, 3rd Annual Combined Conference, Los Angeles, 17-19 October 1977. Marine Technology Society and Institute of Electrical and Electronics Engineers, 1977. p. 28A-1 - 28A-5. Conference Record, Vol. II.

Tankers, Ships, Safety, Guidelines, Regulations, USCG

The title paper examines the evolution of legislation dealing with tanker safety and the direction in which the Coast Guard is going in an effort to improve tanker safety and avoid some of the disastrous effects of tanker accidents. A number of proposed measures for achieving this purpose are discussed.

79C-1045
TANKER POLLUTION ABATEMENT REPORT: A STUDY OF TANKER CONSTRUCTION, DESIGN, EQUIPMENT AND OPERATING FEATURES RELATED TO IMPROVED POLLUTION ABATEMENT. EXECUTIVE SUMMARY.
Maritime Administration. 1977.
Report MA-SC-730.2-78011. 17 p.

Tankers, Oil transport, Design-engineering, Equipment, Regulations, Segregated ballast

The title report is a summary of findings representing a current assessment of pollution abatement standards for the construction differential subsidy tanker construction program. It is concerned both with the application of pollution abatement features to existing vessels and with new tanker design features.

[from Government Reports Announcements 78(3):170. #PB-273 867. 1977]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1046
HYDROCARBONS AND MARINE ENVIRONMENT [in French]
Mercier, J.P. 1978.
Industrie du Petrole en Europe, Gaz-Chimie 46(497):57-62.

Tankers, Oil discharges, Ballast, Regulations, Statistics, Sources, *Accidents

Although recent tanker accidents have created the impression that they are the main source of hydrocarbon input to the ocean, the US Academy of Sciences estimates that of the 6.1 million tons introduced annually, 3.3 m. tons are from terrestrial sources, 2.2 m. tons are from transportation and offshore exploration, and 0.6 m. tons are from natural seepages. Tankers are still the major source of pollution due to shipping. International rules governing disposal of ballast and tank wash water are weak. Further research into methods for preventing tanker accidents, including unified command and management, is needed.

[from Petroleum Abstracts 19(23):#263,853. 1979]

79C-1047
TANKER SUB
Meredith, D. 1977.
Technology Review 80(1):20-21.

Tankers, Economics, Risk analysis, Design-engineering, Oil transport, Arctic, *Submarine tankers

A scenario of submarine tanker transport of oil is presented, based on a technological and economic feasibility study conducted by two Newport News Shipbuilding engineers, P.K. Taylor and J.B. Montgomery. According to their studies "a system of enormous, nuclear-powered submarine tankers could compete economically with both pipelines and ice-breaking tankers plying a northern route to the east coast, [and] the submarine tankers would operate more reliably and with less ecological risk than either surface tankers or the controversial pipelines."

79C-1048
PROPOSED SINKING TESTS (ULCC) TASK IV
Minorsky, V.U. 1978.
Report GGS-5612-4, MA-RD-920-78041, Contract MA-7-38028. 36 p. Final report.

Tankers, Performance testing, Design-engineering, Pollution prevention, *Sinking tests

A previous tanker (ULCC) sinking test performed in 1971 in Hamburg, Germany, is translated with new appendices. Recommendations for further tests are given. A list of US Model tanks suitable for this test and a rough cost estimate are provided.

[from Government Reports Announcements 78(16):288. #PB-279 998. 1978]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1049
OIL POLLUTION OF THE OCEANS: A TANKER OWNER'S PERSPECTIVE
Naess, E.D. et al. 1978.
MIT 7th Annual Sea Grant Symposium Proceedings, Cambridge, 24 October 1978. 32 p. Panel discussion.

Pollution control, Tankers, Oil transport, Safety

The author cited the tanker industry's record of safe and spill-free transport and reasons that the trend toward gigantic supertankers will lessen chances of accidents, collisions, and spills by reducing the total number of marine trips and vessels.

[from Environment Abstracts 9(4):#79-02449. 1979]

79C-1050
THROWING LIGHT ON A BLACK SECRET
Pitt, D. 1979.
New Scientist 81(1148):1022-1025.

Ballast, Equipment, Oil discharges, Tankers, Ships, Oil slicks, Monitoring

The problems of operational pollution from tankers are reviewed. At present, the available technology for measuring the hydrocarbons in ballast discharge waters are inadequate, international efforts to define acceptable discharge limits are not progessing rapidly, and the "sheen on water" criterion for discharge waters may be impractical because a sheen may appear at oil levels as low as 4 ppm or as high as 50 ppm. Discussed are new developments in the area of deballasting monitoring systems, which may present solutions for these problems.

79C-1051
CRUDE OIL WASHING - ITS DEVELOPMENT, USE AND RESULTS
UN Inter-Governmental Maritime Consultative Organization. 1977.
UN IMCO Report. 104 p.

Tankers, Crude oil washing, Pollution presention, IMCO

Topics covered in the title report include the following: Selection of ballast patterns and the effect of the patterns on reducing operational discharges; the Crude Oil Washing (COW) sequence; effectiveness of COW, examples of retained slop oil experience, discharge samples and measurements of bottom sediment and water, improvement in cargo discharge; descriptions of typical COW tankwashing equipment; personnel requirements; and economics of COW.

[from Environment Abstracts 9(3):#79-01796. 1979]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

2. Pipelines

79C-1052
SOCIAL IMPACT OF THE TRANS-ALASKA PIPELINE CONSTRUCTION IN VALDEZ, ALASKA 1974-1975
Baring-Gould, M. 1976.
Report BP-279 328. 53 p.

Pipelines, Socioeconomic effects, Trans-Alaska pipeline, Alaska

Socioeconomic problems and community adaptations related to the impact of the Trans-Alaska pipeline on Valdez, Alaska are surveyed.

[from Government Reports Announcements 78(15):145. #PB-279 328. 1978]

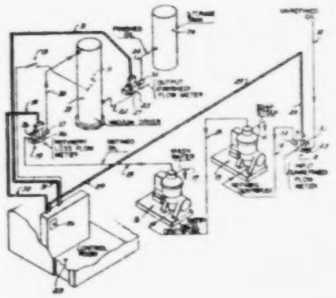
79C-1053
REFINERY AND PIPELINE MONITORING
Elliott, P.F., and K.D. Elliott. 1978.
US Patent 4,106,099

Pipelines, Refineries, Leakage, Detection, Monitoring, Equipment, Design-engineering, Patent

A monitor is described which indicates a series of short-term losses of fluid between two stations along a fluid-flow system, such as a refinery or pipeline.

[from Petroleum Abstracts 19(7):#259,407. 1979]

4,106,099
REFINERY AND PIPELINE MONITORING SYSTEM
Peter F. Elliott, and Kenneth D. Elliott, both of P.O. Box 31227, Cincinnati, Ohio 45231
Continuation-in-part of Ser. No. 704,538, Jul. 12, 1976. This application Jul. 8, 1977, Ser. No. 814,132
Int. Cl.² G01M *3/28;* G01F *1/00;* G06F *15/46*
U.S. Cl. 364—510 **6 Claims**



79C-1054
OIL PIPELINES--CHECK LEAKS AND STAY ON THE RIGHT SIDE OF THE LAW
Klarenberg, A. 1978.
Process Engineering, Aug 1978:71.

Pipelines, Leakage, Detection, Monitoring, Equipment, North Sea, UK

Systems designed to check for leaks in North Sea oil pipelines are legally required in the UK. A computer-based system has been developed for that purpose and some of its current applications are discussed.

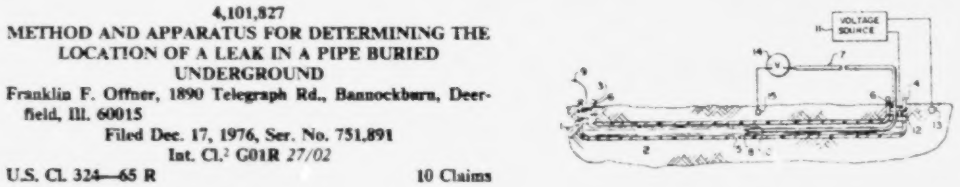
[from Petroleum Abstracts 19(8):#259,766. 1979]

79C-1055
METHOD AND APPARATUS FOR DETERMINING THE LOCATION OF A LEAK IN A PIPE BURIED UNDERGROUND
Offner, F.F. 1978.
US Patent 4,101,827

Pipelines, Leakage, Detection, Equipment, Design-engineering, Patent

The method is applicable to plastic pipes buried in an electrically conductive medium. The pipe is filled with an electrolyte and an electric current is passed through the fluid so that a voltage gradient is established, and the gradient is analyzed to determine the location of the leak. [possibly oil pollution related]

[from Petroleum Abstracts 19(7):#259,408. 1979]



4,101,827
METHOD AND APPARATUS FOR DETERMINING THE LOCATION OF A LEAK IN A PIPE BURIED UNDERGROUND
Franklin F. Offner, 1890 Telegraph Rd., Bannockburn, Deerfield, Ill. 60015
Filed Dec. 17, 1976, Ser. No. 751,891
Int. Cl.² G01R *27/02*
U.S. Cl. 324—65 R **10 Claims**

VOLTAGE SOURCE
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3. Loading and Offloading Facilities

79C-1056
SHETLAND OIL TERMINAL ENVIRONMENTAL ADVISORY GROUP (SOTEAG): STATEMENT ON SULLOM VOE OIL SPILL - 21 FEBRUARY 1979 [news brief]
Anon. 1979.
Marine Pollution Bulletin 10(4):96-97.

Oil spills, Fuel oil, Environmental effects, Spill response, Oil terminals, Scotland, *Sullom Voe terminal, *Esso Bernicia spill

In a statement relative to the spillage of fuel oil from the Esso Bernicia on 30-31 December 1978, SOTEAG "concluded that it is not satisfied with the present capability at the terminal for containment and recovery of spilt oil." Reasons for this conclusion are briefly discussed.

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1057
SULLOM VOE COMES ON FLOW [editorial]
Bourne, W.R.P. 1979.
Marine Pollution Bulletin 10(4):93-94.

Spill response, Spill cleanup, Oil terminals, Tankers, Contingency planning, Scotland, *Esso Bernicia spill, *Sullom Voe terminal

Various events leading up to the holing of the 190,000 ton tanker Esso Bernicia are discussed in light of what the author thinks is a totally inadequate spill response capability at the terminal in Sullom Voe, Scotland. A growing concern among local inhabitants could mean closing of the port until spills can be dealt with more efficiently.

79C-1058
BACKGROUND INFORMATION ON NATIONAL AND REGIONAL HYDROCARBON EMISSIONS FROM MARINE TERMINAL TRANSFER OPERATIONS
Burklin, C.E., W.C. Micheletti, and J.S. Sherman. 1977.
Report RAD-77-100-139-02-11, EPA/450/3-77/024, Contract EPA-68-01-4136. 127 p.

Hydrocarbons, Crude oil, Petroleum products, Oil transfer, Oil terminals, Leakage, Pollution control, Tankers

Results are presented of a study to assess the effectiveness of marine terminal emission control by modification of operating procedures as an alternative to vapor recovery systems. Topics include transportation of petroleum and petroleum products, projections of transport activities, marine terminal operations, sources of hydrocarbon emissions, and operational control technology.

[from Government Reports Announcements 78(6):167. #PB-275 485. 1978]

79C-1059
OFFSHORE FUEL-UNLOADING SYSTEM: A PILOT STUDY
Pannell, O.R., and F.M. Cevasco. 1978.
Report MERADCOM-2228. 78 p. Preliminary report.

Tankers, Oil transfer, Equipment, Pollution prevention

The title pilot study is intended to provide the first step towards identification of an optimum tanker discharge system which would ultimately replace portions of the present system. The study examines various operational significant variables (nearshore gradient, weather, fuel demand) and conduit stress requirements. Identification of several solutions based on findings are presented.

[from Government Reports Announcements 78(17):255. #AD-A054 128. 1978]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1060
CONTINUING SAGA OF SULLOM VOE
Sage, B. 1979.
New Scientist 82(1152):260-261.

Oil terminals, Tankers, Oil spills, Fuel oil, Mortality, Environmental effects, Coasts, Birds, Wildlife, *Sullom Voe terminal, *Esso Bernicia spill

The author discusses the Esso Bernicia spill at the Sullom Voe oil terminal in Shetland, which occurred on 30 December 1978 and resulted in the spillage of nearly 1,200 tons of bunker C fuel oil. Critically examined is the slow and inadequate response of port authorities, the inadequacy of oil industry contingency plans, and the continuing poor navigation of some of the incoming tankers. The spill resulted in heavy damage to sheep, otters, birds, and coastal areas.

79C-1061
DISASTER AT SULLOM VOE
Sage, B. 1979.
New Scientist 82(1151):183-184.

Oil terminals, Environmental effects, Tankers, Oil spills, *Sullom Voe terminal, *Esso Bernicia spill

Serious pollution problems have arisen at the new Sullom Voe oil terminal in Shetland as a result of operational tanker discharges, as well as a fuel oil spill from the tanker Esso Bernicia on 30 December 1978. This article outlines the background of the development of the oil storage and tanker loading terminal at Sullom Voe and discusses the possible sources of pollution, mainly the illegal dumping of oily ballast waters by "rogue tankers."

79C-1062
WOE AT SULLOM VOE
Stansell, J. 1979.
New Scientist 81(1148):1024.

Oil terminals, Tankers, Oil-water separation, Surveillance, Oil spills, Fuel oil, Biological effects, Scotland, *Sullom Voe terminal

Shetland islanders are concerned about inadequate oil-water separation equipment and facilities at the Sullom Voe oil terminal, the lack of enforced tanker routes to the terminal, inadequate air surveillance of tankers, and a total inadequacy of knowledge of how to deal with spills of heavy bunker fuel, and of their effects on birds and marine life.

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

4. Storage Facilities

[No entries.]

5. Legal and Regulatory Aspects

79C-1063
NEW POLLUTION RULES LISTED [news brief]
Anon. 1977.
World Dredging and Marine Construction 13(2):1-78.

Tankers, Regulations, US, USCG, Segregated ballast, Wastewaters, Oil discharges, Pollution control, Ports

The 13 December 1976 issue of the Federal Register lists new USCG regulations in effect for US tankers in domestic trade. New and existing foreign vessels entering US ports would be required to meet similar design and equipment standards as required for US vessels. The regulations govern discharge limits for oily water, require segregated ballast tanks and slop tanks for consolidating wastewaters, and call for improved ability to withstand flooding damage, especially in the engine room. These measures should help to contol the oil spills in tanker operations and accidents.

79C-1064
THE 1977 CLEAN WATER ACT AMENDMENTS - CONFLICTS AND CONTRADICTION
Bernhardt, J.P. 1978.
Marine Technology Journal 12(5):28.

Oil transport, Tankers, Ships, Liability, Legislation, Regulations, International agreements, International conventions, *Law of the Sea

Concern is expressed by the author about new amendments to the Clean Water Act dealing with prescriptive rights for oil and hazardous substances. By unilaterally applying questionable powers out to 200 mi, the US may be reinforcing "the exclusive nature of the economic zone" as well as indirectly encouraging a "patchwork quilt" of individual nations promulgating similar national legislation.

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1065
OIL SPILLS TRIGGER NEW STANDARDS
Demeter, J. 1977.
Transportation USA 3(3):6-9.

Safety, Tankers, Oil spills, Personnel training, Regulations

During the 21 days following the Argo Merchant grounding, seven more tankers were involved in accidents taking 46 lives, injuring 52 people, and spilling more than 61 million L (16 million gal) of petroleum products in or around US waters. Initiatives to assure well-maintained ships and competent crews are described.

[from Environment Abstracts 7(12):#77-06513. 1977]

79C-1066
THE EXTENT TO WHICH MARINE TRANSPORTATION WITHIN THE ECONOMIC ZONE WILL BE AFFECTED BY POLLUTION CONTROLS
Graham, N.W. 1976.
Woods Hole Oceanographic Institute Report. WHOI-76-95. 12 p.

Oil transport, Regulations, Coastal zone management

Restricted navigation to prevent pollution was established by jurisdiction within the economic zone. Conflicts in the negotiations and the present compromise are explained.

[from Environment Abstracts 8(1):#78-00382. 1979]

79C-1067
STATE CONTROL OF OIL POLLUTION LEGISLATION IN THE TWILIGHT ZONE
Lipeles, M. 1976.
Harvard Environmental Law Review, Vol. 1:431-457.

Legislation, Spill cleanup, Compensation, Liability, Coastal waters

Some spills will inevitably occur from activities such as transporting Alaskan oil along the West Coast in supertankers and constructing deepwater oil ports. Oil spill laws must complete three criteria: Provision for rapid and responsible cleanup of the spill; compensation to all those damaged by the spill, including affected fishermen and resort owners; and the requirement that spillers pay all cleanup and damage costs.

[from Environment Abstracts 8(3):#78-01824. 1978]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1068
SHIPWRECKS, POLLUTION, AND THE LAW OF THE SEA
McManus, R.J. 1977.
National Parks and Conservation Magazine 51(6):10-15.

IMCO, International conventions, Pollution control, Safety, Tankers, Liability, *Law of the Sea

The 1973 rules revision in an IMCO treaty, if ratified, would extend and strengthen the seminal efforts of the 1954 convention on marine pollution control. The problem of unilateral moves to impose stricter standards, including double bottoms in tankers, remains unresolved. International mechanisms are also deficient in the areas of liability and compensation for damage caused by oil pollution.

[from Environment Abstracts 8(2):#78-01099. 1978]

79C-1069
CONTROL OF HYDROCARBONS FROM TANK TRUCK GASOLINE LOADING TERMINALS
Polglase, W., W. Kelly, and J. Pratapas. 1977.
Report EPA-450/2-77/026, OAQPS-1.2-82. 63 p.

Gasoline, Oil transfer, Pollution prevention, Economics, Regulations, Guidelines, Cost analysis

The title report provides guidance for development of regulations to limit pollution from gasoline truck loading facilities. Guidance includes emission limits, techniques for control equipment, and analyses for cost effectiveness of loading terminal controls.

[from Governments Reports Announcements 78(5):178. #PB-275 060. 1978]

6. General Aspects

79C-1070
SLICK REPORTS ON A YEAR'S OIL SPILLS [news brief]
Anon. 1979.
New Scientist 82(1157):709.

Oil spills, Statistics, UK, Ireland

This article reviews statistics on 1978 oil spills which were published by the Center for Short Lived Phenomena in Oil Spill Intelligence Report, Vol. 2, No. 12. Over 500 spills occurred around the coasts of the UK and Ireland, at least 175 of which involved heavy fuel oil. Internationally, some 800 million L (206 million gal) of oil were spilled or burned, of which about 250 million L (66 million gal) were spilled by the Amoco Cadiz. In all, 141 oil spills of over 75,000 L (20,000 gal) each were listed for 1978.

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

79C-1071
ALASKAN OIL TRANSPORTATION ISSUES
Brown, R. 1977.
Report EPA/600/9-77/019, Contract EPA-68-01-3188. 17 p. (Executive summary)

Pollution prevention, Oil transport, Environmental effects, Tankers, Trans-Alaska Pipeline, Alaska

This report is intended to acquaint officials and the public with potential environmental impacts posed by the increased transport of Alaskan oil. Air, water, and land pollution potentials are discussed together with the history and problems associated with assuring environmental compatibility.

[from Government Reports Announcements 78(8):147. #PB-276 449. 1978]

79C-1072
TANKER AND OIL TRANSFER OPERATIONS ON THE DELAWARE RIVER AND BAY
Government Accounting Office. 1977.
GAO Report CED-77-124. 29 p.

Safety, Oil transport, Oil transfer, Tankers, Pollution prevention, Regulations, Delaware Bay

Safety of oil shipping and transfer operations is examined. Expanded requirements for navigational, steering, and pollution prevention equipment, and proposed US regulations have the potential to reduce accidents. Expanded inspection programs should help improve the tankship safety.

[from Environment Abstracts 8(7/8):#78-04155. 1978]

79C-1073
GROUND-WATER POLLUTION - A STATUS REPORT
Lindorff, D.E. 1979.
Ground Water 17(1):9-17.

Groundwater, Contamination, Pollution control, Sources, Petroleum products, Storage, Pipelines, Regulations

This paper, presented at the Fourth National Ground Water Quality Symposium [Minneapolis, Minnesota, 20-22 September 1978] focuses on the results of over 170 case studies of groundwater contamination and pollution from a variety of sources including petroleum products storage tanks and pipelines. The studies indicate that the extent of contamination is determined by the hydrogeologic conditions, the nature of the contaminant, and the effectiveness of regulatory action. Recommendations are made toward minimizing the incidence of groundwater contamination.

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

1. Waste Treatment and Disposal Methods

79C-1074
BALLAST WATER TREATMENT PLANT EXCEEDS SPECIFICATION
Anon. 1978.
Petroleum Times 82(2083):17, 20, 48.

Ballast, Tankers, Wastewater treatment, Oil removal, Mediterranean Sea

"The new Mediterranean ballast water treatment plant to service the tankers loading from the SUMED pipeline has achieved very high oil removal efficiencies." The treatment process is described.

[from Petroleum Abstracts 19(13):#261,197. 1979]

79C-1075
FORMATION OF INDUSTRIAL WASTE WATERS AT A PETROLEUM- AND GAS-EXTRACTION INSTALLATION AND THEIR PURIFICATION BY COAGULATION [in Russian]
Anon. 1977.
Referativnyi Zhurnal, Khimiya, 1978: Abstract No. 12I511.

Wastewater treatment, Refining, Extraction

Summary not available.

[from Chemical Abstracts 89(14):#117203x. 1978]

79C-1076
ELIMINATION OF HYDROCARBONS IN WATER BY COALESCENCE ONTO OLEOPHILIC RESINS [English summary]
Aurelle, Y., H. Roques, and G. Leygue. 1978.
Informations Chimie, Vol. 175:123-125.

Crude oil, Coalescence

"When water containing 15-200 g/m^3 crude and mineral oil was passed through a coalescing tower containing an oleophilic resin, obtained by fixation of an ionic surfactant on ion exchange resins, the oil content was reduced to 0.4 g/m^3."

[from Chemical Abstracts 89(10):#79712c. 1978]

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1077
DISPOSAL OF PETROLEUM SLUDGES
Bibikov, G.G. 1976.
Chemistry and Technology of Fuels and Oils 12(11-12):862-866.

Waste oil treatment, Sludges, Refineries, Petrochemicals, Equipment, USSR

Reported are the composition and properties of petroleum sludges from the Kirishi petroleum refinery and the Salavat petrochemical combine, USSR. An approach is described for collecting and processing petroleum sludges that uses specially designed enclosed oil-sludge separators, settling tanks for the horizontal or radical hydrocyclones, and centrifuges for mechanical removal of bottom sediment.

[from Environment Abstracts 8(10):#78-05436. 1978]

79C-1078
TREATING WASTE OIL
Borenstein, L. 1978.
Canadian Patent 1,027,502

Waste oil treatment, Lubricating oil, Reclamation, Patent

A method for reconditioning waste lubricating oil involves distillation to remove fractions of boiling points below 600° F, and admixing a prescribed quantity of H_2O, ammonium persulfate and nonionic surfactant (Siponic NP-9) at 180° F for 2 hrs.

[from Chemical Abstracts 89(16):#132258n. 1978]

79C-1079
USE OF POLYETHYLENIMINE FOR THE PURIFICATION OF PETROLEUM-CONTAINING WASTE WATERS [in Russian]
Butseva, L.N., N.S. Goryachev, L.V. Gandurina, I.N. Myasnikov, and V.M. Gudasheva. 1977.
Referativnyi Zhurnal, Khimiia, 1978:Abstract No. 12I510.

Wastewater treatment, Oil removal, Industries, *Polyethylenimine

Summary not available.

[from Chemical Abstracts 89(14):#117200u. 1978]

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1080
EMISSIONS AND EFFLUENTS FROM EUROPEAN REFINERIES [English summary]
Cadron, E.C., and J.P. Klein. 1977.
CONCAWE Report, No. 6:23 p.

Wastewater treatment, Refineries, Europe, Statistics

"A review with 23 references is presented."

[from Chemical Abstracts 89(16):#131905j. 1978]

79C-1081
WASTEWATER TREATMENT USING FLOCCULATION, COAGULATION, AND FLOTATION (CITATIONS FROM THE AMERICAN PETROLEUM INSTITUTE DATA BASE)
Cavagnaro, D.M. 1978.
Report NTIS/PS-78/0247. 149 p. Report for 1968 - Mar 78. (Supersedes NTIS/PS-77/0057)

Wastewater treatment, Refineries, Pollution control, Bibliographies, Flotation, Flocculation, *Coagulation

This bibliography cites worldwide research on industrial wastewater treatment with particular emphasis on the petroleum and chemical industries. The bibliography contains 137 abstracts, 33 of which are new entries.

[from Government Reports Announcements 78(11):173. #NTIS/PS-78/0247. 1978]

79C-1082
PURIFICATION OF HYDROCARBON POLLUTED WATERS: PREPARATION AND MATERIAL PROPERTIES STUDY
Espinosa, H., G. Goma, and A. Tribellini. 1978.
Water Research 12(1):11-20.

Wastewater treatment, Pollution control, Hydrocarbons, Sorbents, *Hydrophobic material

"A description is given of the production of a hydrophobic solid and its use in the treatment of water polluted with hydrocarbons....This material, which is a powerful interceptor of hydrocarbons, can be used in water treatment." The material described consists of a support of sand or brick onto which fatty amines are grafted.

[from Chemical Abstracts 89(18):#152444y. 1978]

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1083
WASTE OIL FACT SHEET
Federal Energy Administration. 1976.
Report TID-28212. 16 p.

Waste oil treatment, Statistics, Refining, Reuse

This document presents numerous statistics relative to the generation, collection, refining and reuse of waste oils. A discussion is given of the waste oil recovery program. Issues are summarized, results of federal research are given, and the federal government's position on these issues is discussed.

[from Energy Research Abstracts 3(13):#31272. 1978]

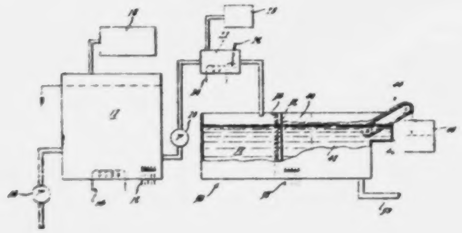
79C-1084
BREAKING AN OIL-IN-WATER EMULSION
Golovoy, A. 1978.
US Patent 4,081,338

Oil-water separation, Emulsions, Wastewaters, Wastewater treatment, Patent

An oil-containing wastewater emulsion is adjusted to pH 6-10, ≥1 ppm Fe^{2+} Fe^{3+}, Al^{3+}, Cu^{+} or Cu^{2+} is added, and the emulsion is treated with a dissolvable Fe electrode, to develop an Fe^{2+}-oil weight ratio of ≥02. Using this method, the emulsion separates in minutes instead of hours.

[from Chemical Abstracts 89(18):#152060v. 1978]

4,081,338
METHOD OF BREAKING AN OIL-IN-WATER EMULSION
Amos Golovoy, Inkster, Mich., assignor to Ford Motor Company, Dearborn, Mich.
Filed Dec. 27, 1976, Ser. No. 754,923
Int. Cl.² C02B *1/82*
U.S. Cl. 204—149 **6 Claims**



79C-1085
PURIFICATION OF INDUSTRIAL PETROLEUM-CONTAINING WASTE WATERS USING POLYELECTROLYTES [in Russian]
Gudasheva, V.M. 1977.
Referativnyi Zhurnal, Khimiia, 1978:Abstract No. 12I509.

Wastewater treatment, Oil removal, *Polyelectrolytes

Summary not available.

[from Chemical Abstracts 89(14):#117198z. 1978]

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1086
CONTROL OF REFINERY VACUUM PRODUCING SYSTEMS, WASTEWATER SEPARATORS AND PROCESS UNIT TURNAROUNDS
Hustvedt, K.C., and R.A. Quaney. 1977.
Report EPA/450/2-77/025, OAQPS-1.2-081. 50 p.

Refineries, Wastewaters, Petroleum products, Oil-water separation, Pollution prevention, Cost analysis, Guidelines

This report provides guidance for development of regulations to limit discharge of volatile organic compounds and reduce wastewater separator and process unit turnarounds. An example cost analysis for evaluating cost effectiveness of these controls is presented.

[from Government Reports Announcements 78(6):169. #PB-275 662. 1978]

79C-1087
OIL ADSORBENTS
Imao, M., A. Nakajima, and M. Edamatsu. 1978.
Japanese Kokai (patent application) 78 39,651

Wastewater treatment, Oil slicks, Adsorption, Sorbents, Patent

A mixture of 20-80% thermoplastic fibers containing metal oxide or hydroxide powder, and thermoplastic fibers is used for treating oily wastewaters and for oil slick control. The mixture is formed into sheets, beads, or packing material. The metal oxides or hydroxides used are Mg, Zn, Pb, Fe, Co, Ni or Cu, and the fibers are made of polypropylene, polyethylene, or polyethylene terephthalate.

[from Chemical Abstracts 89(18):#135213e. 1978]

79C-1088
SLUDGE FARMING OF REFINERY WASTES AS PRACTICED AT EXXON'S BAYWAY REFINERY AND CHEMICAL PLANT
Lewis, R.S. 1976.
National Conference on Disposal of Residues on Land, St. Louis, 13-15 September 1976. p. 87-92.

Land farming, Sludge, Waste disposal, Refineries, Petrochemicals

An eight-acre farm is used to dispose of as much as 3,500 tons/yr of oily waste materials. Runoff is controlled by frequent disking along natural land contours.

[from Environment Abstracts 8(11):#78-06120. 1978]

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1089

REMOVAL OF EMULSIFIED OILS FROM WASTEWATERS

Nakano, S., and T. Tsutomu. 1978.
Japanese Kokai (patent application) 78 61,165

Wastewater treatment, Oil-water separation, Emulsions, Oxidation, Filtration, Patent

"Wastewaters containing emulsified oils are treated with an oxidizing material and passed through fine composite materials made from fine inorganic particles and organic polymers."

[from Chemical Abstracts 89(16):#135226m. 1978]

79C-1090

DISPOSING OF WASTE WATER CONTAINING EMULSIFIED OIL

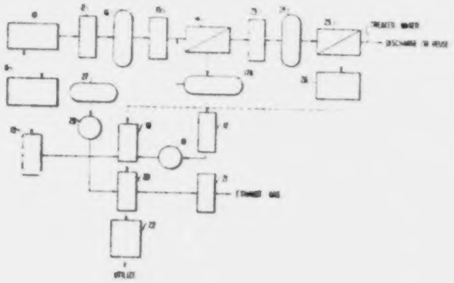
Noda, M., and K. Nomura. 1978.
US Patent 4,086,164

Emulsions, Filtration, Wastewater treatment, Combustion, Patent

Oily wastewater emulsions are fist concentrated without breaking the emulsion, then "the concentration thus obtained with solid material from filtration of the oil-containing wastewater and, optionally, with the filtration aids and the homogeneous, stable mixture obtained is combusted."

[from Chemical Abstracts 89(16):#135217j. 1978]

4,086,164
METHOD OF DISPOSING OF WASTE WATER
CONTAINING EMULSIFIED OIL
Mitsuhiko Noda, and Kikuo Nomura, both of Osaka, Japan, assignors to Sumitomo Electric Industries, Ltd., Osaka, Japan
Filed Mar. 10, 1976, Ser. No. 665,480
Claims priority, application Japan, Mar. 10, 1975, 50-29208
Int. Cl.² C02C *5/04*
U.S. Cl. 210—46 11 Claims



79C-1091

GROUND DISPOSAL OF OIL SHALE WASTES: A REVIEW WITH AN INDEXED ANNOTATED BIBLIOGRAPHY THROUGH 1976

Routson, R.C., and R.M. Bean. 1977.

Solid wastes, Wastewaters, Disposal, Oil shale, Bibliographies

This review covers the available literature concerning ground disposal of solid wastes and effluents from a potential oil shale industry.

[from Chemical Abstracts 89(16):#134996a. 1978]

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1092
A REVIEW OF THE ENVIRONMENTAL IMPACT OF GROUND DISPOSAL OF OIL SHALE WASTES
Routson, R.C., R.E. Wildung, and R.M. Bean. 1979.
Journal of Environmental Quality 8(1):14-19.

Oil shale, Disposal, Environmental effects

Oil shale technology is briefly discussed, and the environmental impacts of ground disposal of waste products are described. [possibly oil pollution related]

[from Environment Abstracts 9(4):#79-02570. 1979]

79C-1093
REMOVAL OF HYDROCARBON-CONTAINING IMPURITIES FROM AN AQUEOUS MEDIUM
Sader, G. 1978.
German Offenlegungsschriften (patent application) 2,750,431

Wastewater treatment, Hydrocarbons, Patent

Hydrocarbon contaminants in wastewaters are separated in floating and bottom beds using quaternary NH_4^+ salts and alum as coagulatants for the floating bed and starch as a coagulant for the bottom bed.

[from Chemical Abstracts 89(18):#152076e. 1978]

79C-1094
EMULSION-BREAKING MATERIAL
Suzuki, H., T. Ono, W. Yamamoto, and M. Yamaguchi. 1978.
German Offenlegungsschriften (patent application) 2,750,838

Emulsions, Wastewater treatment, Patent

"The title compositions, useful in purification of wastewaters containing oil emulsions, consist of substrates coated with organic compounds having hydrophobic, C_{6-60}-hydrocarbon components and hydrophilic functional groups containing N, S, and O."

[from Chemical Abstracts 89(14):#117294c. 1978]

79C-1095
OIL ADSORBENTS FOR REMOVAL OF OILS FROM WASTEWATER
Tanaka, S., and T. Suda. 1978.
Japanese Kokai (patent application) 78 55,660

Wastewater treatment, Oil-water separation, Adsorption, Patent, *Ferrite powder

"Powdered CuZnMg ferrite (particle size 0.5-50μ) is used for removing oil from wastewater by magnetic separation." In a test, oil content of wastewater was lowered from 1870 ppm to 613 ppm, using 5% ferrite powder.

[from Chemical Abstracts 89(14):#117300b. 1978]

79C-1096
OIL ADSORBENTS USEFUL FOR REMOVAL OF OILS FROM WASTEWATERS
Tanaka S., and T. Suda. 1978.
Japanese Kokai (patent application) 78 55,658

Wastewater trestment, Adsorption, Oil-water separation, Patent, *Ferrite powder

"Powdered NiCuZn ferrite (particle size 0.5-50μ) is used for oil removal from wastewater by magnetic separation." In a test, oil content in wastewater was lowered from 1742 ppm to 631 ppm, using 5% ferrite powder.

[from Chemical Abstracts 89(14):#117301c. 1978]

79C-1097
TREATMENT OF WASTEWATERS CONTAINING ORGANIC AND INORGANIC SUBSTANCES
Tsukamoto, K. 1978.
Japanese Kokai (patent application) 78 45,670

Wastewater treatment, Filtration, Oil-water separation, Patent

Wastewaters containing organic and inorganic substances, including oil, are passed through ultrafiltration permeation membranes and thereby separated into a concentrated liquid and membrane-permeated liquid. In a test of the process, wastewater containing 520 ppm oil was split into a watery fraction, containing 0.5-1.0 ppm oil, and a concentrated oil fraction.

[from Chemical Abstracts 89(16):#135227n. 1978]

79C-1098
WASTEWATER PURIFICATION
Watanabe, K. 1978.
Japanese Kokai (patent application) 78 25,058

Wastewater treatment, Filtration, Patent

Oil-containing wastewaters are treated to precipitate the suspended solids and oils, then 0.05 to 1.0 part K alum and optionally a polymer coagulant is added per 100 parts wastewater, followed by filtration through perlite or diatomaceous earth.

[from Chemical Abstracts 89(16):#135216h. 1978]

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1099
TREATMENT AND STABILIZATION OF POLYCHLORINATED BIPHENYLS, (PCB'S) CONTAMINATED WATER AND WASTE OIL. A CASE STUDY. WHITEHOUSE, FLORIDA
Wilkerson, R.T., F.B. Stroud, and A. Smith. 1977.
Report PB-273 842. 35 p. Technical report June 76 - June 77.

Wastewater treatment, Health hazards, EPA, Rivers, Florida

A study was made concerning one method of treating a substantial Environmental Emergency and a potential health hazard. An inexpensive treatment system was formulated that allows the discharge of a mixture of oil, PCB's and water harmlessly into a river.

[from Government Reports Announcements 78(3):99. #PB-273 842. 1978]

2. Oil-Water Separation

79C-1100
FILTER FOR SEPARATING OIL FROM WATER
Kawauchi, A., Y. Nagi, T. Takahashi, and J. Kawashima. 1977.
Japanese Patent 77 47,434

Oil-water separation, Filtration, Sorbents, Patent

Pulp-like polyolefin fibrils are dispersed in water and filtered through a porous support thereby forming a filter for separating oil from water. The polyolefin filter layer has high mechanical strength and oil removal efficiency.

[from Chemical Abstracts 89(14):#117249s. 1978]

79C-1101
OIL/WATER SEPARATOR FOR DEBALLASTING OPERATIONS
Mittelman, J., and V. DiNenna. 1977.
Oceans '77 Conference, 3rd Annual Combined Conference, Los Angeles, 17-19 October 1977. Marine Technology Society and Institute of Electrical and Electronics Engineers, 1977. p. 28B-1-28B-6. Conference Record, Vol. II.

Oil-water separation, Ballast, Tankers, Ships

A system developed by the Navy for treating ballast water with an oil/water separation system at a rate of 3000 gpm is briefly discussed. The system, proposed for development in 1974 and known as OPC-3000, is installed and operating at the Craney Island Fuel Depot in Portsmouth, Virginia.

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1102
OIL/WATER SEPARATION: STATE-OF-THE-ART
Osamor, F.A., and R.C. Ahlert. 1978.
Report EPA/600/2-78/069, Grant EPA-R-803978. 105 p. Final report.

Oil-water separation, Pollution prevention, Equipment, Design-engineering

State-of-the-art oil/water separating devices are classified according to the primary mechanism that induces separation. Basic concepts, specific design features, operational conditions and limitations of each category are discussed. Specific deficiencies in existing categories are identified.

[from Government Reports Announcements 78(17):253. #PB-280 755. 1978]

79C-1103
PROCESS FOR SEPARATING HYDROCARBONS FROM WATER
Preus, P. 1978.
Canadian Patent 1,043,759

Oil-water separation, Absorption, Patent

The process includes the following steps: 1) forming an aqueous mix of expanded perlite,clays, asphalt, and fibrous material to produce a coherent member; 2) removing the moisture from the mixture; and 3) comminuting the material to produce a loose mass having an average fiber length of not less than 1/8 in. When introduced into an organic liquid-water system, the mass selectively absorbs the organic liquid.

[from Petroleum Abstracts 19(17):#262,276. 1979]

79C-1104
AN IMPROVED SYSTEM FOR SEPARATING AND REMOVING OIL BASED MATTER FROM LIQUIDS SUCH AS WATER
Ravagnan, G. 1978.
South African Patent 77/7,561

Oil-water separation, Design-engineering, Patent

The system consists of a number of vertical rotating disks, partly immersed in the liquid-containing matter. Means are provided for separating from the disks materials adhering to them and conveying those materials to a container. The materials are periodically discharged from the container. Materials present on the liquid surface may be preferentially conveyed towards the disks.

[from Petroleum Abstracts 17(20):#263,054. 1979]

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1105
PROCESS FOR SEPARATING HYDROCARBON POLLUTION IN A WATER-ORGANIC LIQUID MIXTURE
Sader, G. 1978.
French Patent 2,372,772

Oil-water separation, Hydrocarbons, Emulsions, Patent

A hydrocarbon-rich upper layer is treated with salts of quaternary ammonium to separate it into a clear upper layer that is usable as fuel oil. The lower layer, an emulsion of hydrocarbons in water, is treated with a polyose and a coagulant to obtain clean water.

[from Petroleum Abstracts 19(18):#262,504. 1979]

3. Waste Oil Reclamation and Reuse

79C-1106
REREFINING WASTE OIL
Berry R. 1979.
Chemical Engineering 86(9):104-106.

Reclamation, Recycling, Waste oil treatment

The title article briefly discusses some new techniques being applied in the US and Europe to re-refine waste oils. Problems with the traditional acid clay process for re-refining lubricating oils are compared to several new processes. New approaches inlude filtering out of metals, vacuum distillation and hydrofinishing, and sodium removal of contaminants. All processes demonstrate a marked improvement over the acid clay process in recoverable products and decreases in toxic byproducts.

79C-1107
ANALYSIS OF 30 USED MOTOR OILS
Cotton, F.O., M.L. Whisman, J.W. Goetzinger, and J.W. Reynolds. 1977.
Hydrocarbon Processing 56(9):131-140.

Waste oils, Crankcase oil, Lubricating oil, Chemical analysis, Hydrocarbons, Chromatography, Reclamation, US

Thirty waste lubricating oils, mostly automotive crankcase oils from around the US, were analyzed by chromatography for their saturate, monoaromatic, diaromatic, and polyaromatic-polar fractions. These analyses were conducted to assist re-refiners to judge the effectiveness of waste oil treatment and reclamation technologies.

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

79C-1108
USED OIL: COLLECTION, RECYCLING AND DISPOSAL
Irwin, W.A. 1978.
Technology Review 80(8):54-61.

Crankcase oil, Waste oil, Disposal, Environmental effects, Health hazards, Reclamation, Recycling, US, Legislation, State government, Europe

This article outlines the health hazards and environmental effects of improper disposal of used crankcase and industrial oils and briefly describes the major technical processes for recovering and re-refining waste oils. The US is beginning to follow Europe's initiatives in oil recycling, and some states are passing legislation to provide for the collection and recycling of used oil. Federal, state and European programs for oil recycling are highlighted.

79C-1109
REGENERATION OF IRON-CONTAMINATED LUBRICATING OILS
Satake, T. 1978.
Japanese Kokai (patent application) 78 34,806

Reclamation, Lubricating oil, Patent, *Fe-contaminated oils

Fe-contaminated lubricating oils are regenerated by adjusting the water content to $\leq$0.03%, treating with water-in-oil emulsions containing water soluble polymers that coagulate the Fe, and separating the Fe.

[from Chemical Abstracts 89(10):#77518v. 1978]

79C-1110
REGENERATION OF SPENT OILS. I [English summary]
Skerlev, P., and K. Velebir. 1978.
Nafta (Zagreb) 29(1):24-32.

Reclamation, Refining, Recycling, Lubricating oil, Waste oil, Environmental effects

"Processes for repeated regeneration of used lubricating oils are discussed in relation to the environmental effects of used oils and the amount of used oil anticipated in the near future."

[from Chemical Abstracts 89(18):#149064u. 1978]

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

4. Legal and Regulatory Aspects

79C-1111
SOLID WASTE LAW BECOMES THREAT TO OIL
Bachman, W.A. 1979.
Oil and Gas Journal 77(6):26-28.

Oil industry, Solid wastes, Legislation, Regulations, EPA

The potential effects of the Solid Waste Disposal Act and the Resource Conservation and Recovery Act on the oil industry are discussed. The effects stem from EPA's proposed criteria for hazardous wastes which include drilling muds, chemicals used in drilling operations, water and brine from wells, oil spills, and used motor oil.

[from Petroleum Abstracts 19(7):#259,446. 1979]

H. MISCELLANEOUS

79C-1112
OIL SPILLS: WHY CLEAN THEM UP?
Anon. 1978.
Offshore Services 11(5):29, 32.

Sources, Statistics, Oceans, Tankers, Wastewaters, Oil discharges, Natural seepage, *Scarlet prawn

Offshore oil production can be blamed for only one third of one percent of the six million tons of oil entering the world's oceans each year, or 4% when tanker spills are added. Land drainage and urban/industrial waste contribute 44%, operational tanker discharges 30%, and oil seepage and atmospheric fallout each 10%. The scarlet prawn, which thrives off the Dutch East Indies, is capable of separating hydrocarbons from oil residues in very polluted areas.

[from Petroleum Abstracts 19(4):#258,387. 1979]

79C-1113
FIRST ORDER ESTIMATES OF ENERGY REQUIREMENTS FOR POLLUTION CONTROL
Barker, J.L., K. Maddox, J.D. Westfield, and D. Wilcock. 1978.
Report EPA/600/7-78/022, Contract EPA-68-01-4150. 97 p.

Pollution control, Economic effects, Cost analysis, Refineries, Oil industry

This report presents the estimates of energy demands attributable to environmental control of pollution from stationary point sources. These include power plants, factories, refineries, wastewater treatment plants and others, but do not include mobile sources and sources not producing individual effluent streams. [possibly oil pollution related]

[from Government Reports Announcements 78(13):188. #PB-278 274. 1978]

79C-1114
UNDER THE RED SEA
Kenfield, J. 1978.
Wildlife 20(5):220-226.

Resource management, Oil spills, Red Sea, Israel

The government of Israel declared almost the entire coast of the Red Sea a natural reserve, but already to date two major oil spills have occurred at a port outside of Eilat.

[from Environment Abstracts 8(9):#78-04573. 1978]

H. MISCELLANEOUS

79C-1115
MAPPING OFFSHORE OIL LEASES
Sibert, J.L. 1978.
Report CONF-780209-1, Contract W-7405-ENG-36. 8 p.

Oil-gas leasing, Information systems, Offshore, Exploration, Regulations

A data-base query system has been developed for use as a tool for regulatory decision making. The system allows for complex retrievals to be specified in simple English phrases and for the on-line production of thematic maps. Several examples of the queries and the maps they produce are presented. The procedure is totally automated and can be handled from a remote terminal. [possibly oil pollution related]

[from Government Reports Announcements 78(17):158. #LA-UR-77-2892. 1978]

79C-1116
SUMMARY OF ACCIDENTS RELATED TO NON-NUCLEAR ENERGY
US Environmental Protection Agency. 1977.
Report EPA 600/9-77-012. 15 p.

Oil industry, Safety, Health hazards, *Accidents

Energy systems covered in the title report include coal, crude oil, and oil shale.

[from Petroleum Abstracts 19(7):#259,516. 1979]

SECTION II

CURRENT RESEARCH PROJECTS

Title, contract information, and a summary of project objectives are provided in each entry. Sources of project information include: The Smithsonian Science Information Exchange (SSIE); API Environmental Research Annual Status Report; Maritime Research Information Service Abstracts; Scientific and Technical Aerospace Reports; Department of Environment, Canada, Spill Technology Newsletter; Northwest and Alaska Fisheries Center Monthly Report; and written inquiries to organizations and researchers. Current status information and publications resulting from the projects are presented when such information is available from the principal investigators or performing organizations. The source of status information is given at the end of each entry.

Entries are grouped according to subject and then ordered sequentially with a citation number 79C-R---. Some of the projects listed in previous Oil Pollution Abstracts were recently renewed. These projects are relisted with a current serial number, followed by the original number in parentheses. To locate the original entry, refer to the following list:

Citation Numbers		Dates Covered	Report Number
R-001-74 to R-165-74		July 74 - Oct. 74	EPA-670/2-75-003
R-166-74 to R-244-74		Nov. 74 - Feb. 75	EPA-670/2-75-044
R-245-74 to R-268-74		Feb. 75 - Apr. 75	EPA-670/2-75-059
R-269-74 to R-342-74		May 75 - July 75	EPA-600/2-76-129
R-269-75 to R-304-75		Aug. 75 - Oct. 75	EPA-600/2-76-113
R-001-76 to R-035-76		Nov. 75 - Jan. 76	EPA-600/2-76-185
R-036-76 to R-063-76		Feb. 76 - Apr. 76	EPA-600/2-76-215
R-064-76 to R 123-76		May 76 - July 76	EPA-600/2-76-266
R-124-76 to R-175-76		Aug. 76 - Oct. 76	EPA-600/2-77-037
R-001-77 to R-022-77		Nov. 76 - Jan. 77	EPA-600/2-77-075
R-023-77 to R-039-77		Feb. 77 - Apr. 77	EPA-600/2-77-111
R-040-77 to R-075-77		May 77 - July 77	EPA-600/2-77-243
R-076-77 to R-096-77		Aug. 77 - Oct. 77	EPA-600/2-78-005
R-001-78 to R-020-78	5(1)	Nov. 77 - Jan. 78	EPA-600/2-78-071
R-021-78 to R-057-78	5(2)	Feb. 78 - May 78	EPA-600/7-78-160
R-058-78 to R-150-78	5(3)	Jun. 78 - Sep. 78	EPA-600/7-78-218
R-151-78 to R-200-78	5(4)	Oct. 78 - Dec. 78	EPA-600/7-79-040
79A-R001 to 79A-R009	6(1)	Jan. 79 - Mar. 79	EPA-600/________
79B-R010 to 79B-R069	6(2)	Apr. 79 - June 79	EPA-600/________

CURRENT RESEARCH PROJECTS

A. OIL POLLUTION DETECTION AND EVALUATION

1. Remote Sensing

79C-R070
OPTICAL CHARACTERISTICS OF AGED OIL

Principal Investigators:	Hovis, W.A., J.S. Knoll, and J. Farlow
Performing Organization:	US Environmental Protection Agency, Office of Research and Development, Industrial Environmental Research Lab., Edison, NJ 08817
Supporting Organization:	US Dept. of Commerce, NOAA, National Environmental Satellite Service, Washington, DC 20233
Period:	7/78 - 2/79
Funds:	$17,500 FY 78

Remote sensing, Oil spills, Crude oil, Weathering, Source identification, Physical aspects

In order to measure the optical signature of crude oil samples as they age under conditions simulating those that would follow an oil spill, ten crude oil samples were weathered for four days at the EPA OHMSETT facility. Daily measurements were made of the solar reflectance from the surface in the 0.4-2.4 μ range, blackbody equivalent radiation from the surface in the 10.5-12.5 μ range, and the specific gravity, viscosity, surface tension and interfacial tension of collected samples.

Status: The project has been completed and the results were presented at the NATO, CCMS Workshop on Remote Sensing of Oil Spills held 18-20 April 1979. The proceedings are to be published by the USCG on 10 September 1979.

Information Source: J.S. Knoll, National Environmental Satellite Service, address above.

79C-R071
IR OIL SPILL

Principal Investigator:	Kuhn, P.M.
Performing Organization:	US Dept. of Commerce, NOAA, Environmental Research Lab., Boulder, CO 80302
Supporting Organization:	Same
Period:	10/78 - 9/79
Funds:	$55,000 FY 79

Remote sensing, Oil spills, Detection, Performance testing, Santa Barbara Channel, *IR

The project objective is to determine the applicability of a multichannel infrared line scanner in detecting the presence, thickness, age, type, and extent of oceanic oil spills.

Status: The NOAA-APCL Texas Instruments Line Scanner was to have been updated and refurbished during the first quarter. Overflights of the Santa Barbara Channel seep were scheduled for the remaining three quarters.

[from SSIE No. ZBP-1708]

2. Sampling and Analysis

79C-R072 (R-155-78)
NAVY ENVIRONMENT: NEW ANALYTICAL METHODS
Principal Investigator: Hieftje, G.M.
Performing Organization: Indiana University, School of Arts & Sciences,
Memorial Hall, Bloomington, IN 47401
Supporting Organization: US Dept. of Defense, Navy, Office of Naval
Research, 800 N. Quincy St., Arlington, VA 22217
Period: 5/76 - Cont.
Funds: $41,353 FY 79

Analytical techniques, Hydrocarbons, Seawater, USN

Enhanced analytical capabilities are required in the Navy for several areas including analysis of environmental samples such as seawater and oil residues. This project will investigate instrumentation for rapid multielement analysis based on atomic absorption and emission spectroscopy, examine various methods of signal processing to handle background corrections and spectral interference, and measure detection limits and sensitivities for a large number of elements.

[from SSIE No. GQN-675628-2]

79C-R073 (R-003-78)
NAVY ENVIRONMENT: CHARACTERISTICS AND STABILITY OF COLLOIDAL MATERIAL ACCOMMODATING HYDROCARBONS IN THE OPEN OCEAN
Principal Investigator: Zsolnay, A.
Performing Organization: Duke University, Marine Lab., Durham, NC 27706
Supporting Organization: US Dept. of Defense, Navy, Office of Naval
Research, 800 N. Quincy St., Arlington, VA 22217.
Contract N00014-78-C-0294
Period: 7/75 - Cont.
Funds: $53,150 FY 79

Hydrocarbons, Seawater, Benthos, Sediment, Chemical analysis, *Transport

This project will study the contributions of organic compounds to characterizing the chemical and biological properties of seawater, their role as an energy source for the benthic community, and their effect on sediment physicochemical properties. The mechanism of transport of this material is emphasized. Seawater samples will be collected from the Sargasso Sea for fractionation of colloids and subsequent removal and chemical analysis of sorbed hydrocarbons.

[from SSIE No. GQN-675124-2]

Reports and Publications

THE EFFECTS OF PELAGIC HYDROCARBONS ON THE ROCKY INTERTIDAL FLORA AND FAUNA OF BERMUDA
Maynard, N., C. Gebelein, and A. Zsolnay. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, 8-10 March 1977. p. 499-503. (American Petroleum Institute No. 4284.)

BIOGENIC HYDROCARBONS IN THE INTERTIDAL COMMUNITIES OF THE ROCKY SHORES OF BERMUDA
Zsolnay, A., N. Maynard, and C. Gebelein. 1977.
1977 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), New Orleans, 8-10 March 1977. p. 173-177. (American Petroleum Institute No. 4284.)

CAUTION IN THE USE OF NISKIN BOTTLES FOR HYDROCARBON SAMPLES
Zsolnay, A. 1977.
Marine Pollution Bulletin 9(1):23-24.

HYDROCARBON AND CHLOROPHYLL CORRELATION IN THE WATERS BETWEEN NOVA SCOTIA AND THE GULF STREAM
Zsolnay, A. 1977.
Deep-Sea Research Vol. 24:199-207.

INVENTORY OF NON-VOLATILE FATTY ACIDS AND HYDROCARBONS IN THE MARINE ENVIRONMENT
Zsolnay, A. 1977.
Marine Chemistry 5(4-6):465-475.

LACK OF CORRELATION BETWEEN GAS-LIQUID CHROMATOGRAPH AND UV ADSORPTION INDICATORS OF PETROLEUM POLLUTION AND ORGANISMS
Zsolnay, A. 1977.
Water, Air, and Soil Pollution 9(1):45-51.

SORPTION OF BENZENE ON PARTICULATE MATTER FROM THE SEA
Zsolnay, A. 1977.
Rapports et Procès-verbaux des Réunions. Conseil International pour l'Exploration de la Mer Vol. 171:117-119.

TAR "SPECKS" FOUND IN THE NORTH ATLANTIC
Zsolnay, A. 1977.
Marine Pollution Bulletin 8(5):116-117.

B. OIL POLLUTION PREVENTION AND CONTROL

[No entries.]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

79C-R074

IDENTIFICATION AND QUANTIFICATION OF WATER SOLUBLE COMPONENTS OF JP4

Principal Investigators: Brammer, J.D., and R.L. Puyear
Performing Organization: North Dakota State University, School of Science and Mathematics, Fargo, ND 58102
Supporting Organization: US Dept. of Defense, Air Force, Office of Scientific Research, Bolling Air Force Base, N P Bldg. 410, Washington, DC 20332
Period: 9/78 - 9/79
Funds: $50,397 FY 79

Fuel oil, WSF, Chemical analysis, Bioassay, Toxicity, Uptake, Depuration, Freshwater

Quantitative measurements of individual components of JP-4 will be made over time under different water salinities, temperatures, and states of physical agitation. Acute toxicities of individual components to selected freshwater organisms will be tested. Uptake, accumulation, and depuration will be examined.

[from SSIE No. GQP-53550]

79C-R075

MUTAGENIC POTENTIAL OF DIESEL FUEL

Principal Investigator: Brusick, D.J.
Performing Organization: Litton Bionetics, Inc., 5516 Nicholson Ln., Kensington, MD 20795
Supporting Organization: American Petroleum Institute, 2101 L St. NW, Washington, DC 20037
Period: 10/77 - 9/78
Funds: N/A

Mutagens, Fuel oil, Bioassay, Toxicity, Bacteria, Yeast, Animals

A three-tier bioassay is being used to determine the mutagenicity of diesel fuel. The first tier consists of in vivo microbial assays using bacteria and yeast. The second tier consists of cultured mammalian cells. The third tier consists of in vitro cytogenic analysis of rat bone marrow cells.

[from SSIE No. PAP-147]

79C-R076
DISEASE AND ENVIRONMENTAL STRESS
Principal Investigators: Murchelano, R., J. Bodammer, M. Brubaker, R. Robom, et al.
Performing Organization: US Dept. of Commerce, Oxford Lab., Oxford, MD 21654
Supporting Organization: US Dept. of Commerce, NOAA, National Marine Fisheries Service, Washington, DC
Period: 1978 - N/A
Funds: $161,900 FY 78

Hydrocarbons, Fish, Crustaceans, Mollusks, Biological effects, Toxicity

The objectives of this project include the following: 1) Ultrastructural research on the effects of heavy metals and petroleum, 2) ultrastructural research on the effects of heavy metals and petroleum hydrocarbons on the integument and sensory tissue of larval marine fishes, 3) research on the effects of environmental pollutants on the protozoan and metazoan parasites of marine fishes, crustaceans and mollusks, and 4) maintaining and expanding the Registry of Marine Pathology as a national center for the acquisition and distribution of instructional materials relevant to the study of infectious and noninfectious diseases of marine fish and shellfish.

[from SSIE No. ZBP-1477]

2. Baseline and Environmental Impact Studies

79C-R077
COLLECTION OF ENVIRONMENTAL SAMPLES TO ESTABLISH LEVELS OF CONTAMINANTS IN A REMOTE ARCTIC ENVIRONMENT: THE BACK RIVER BASIN, KEEWAYTIN, NWT, CANADA
Principal Investigators: Beck, R., and J. Stollman
Performing Organization: Eaton Canyon Expeditions, Inc., 684 East St., Carlisle, MA 01741
Supporting Organization: N/A
Period: 3/79 - 12/79
Funds: $20,000

Baseline studies, Hydrocarbons, Contamination, Arctic, Cold climates

The following types of samples are being collected in the title region and analyzed for metals, hydrocarbons, and other organics: Soil, air, moss/tundra vegetations, fish tissue, instream and marine.

Status: Sampling is to be completed by 30 August 1979 and analysis by 30 December 1979.

Information source: Ron Beck, Division of Arctic Research, Energy Resources Co., 185 Alewife Bk. Pkwy., Cambridge, MA 02138

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

79C-R078
DEEP OCEAN ENVIRONMENTAL STUDIES OF MARINE BACTERIA
Principal Investigator: Colwell, R.R.
Performing Organization: University of Maryland, Dept. of Microbiology, College Park, MD 20742
Supporting Organization: US National Science Foundation, Division of Ocean Sciences, 1800 G St. NW, Washington, DC 20550. Contract OCE 76 82655
Period: 12/76 - 5/79
Funds: $4,800 FY 79

Biodegradation, Microorganisms, Distribution, Oceans

The object of this research is to determine the interaction of microorganisms with the deep-ocean environment under in situ conditions. Rates of utilization will be assessed using seawater samples enriched with chitin, cellulose, carbohydrates, urea, and other organic compounds. Biodegradation experiments will use substrates of petroleum heavy metals, and pesticides. Other studies will cover metabolic activity, genetic experiments concerning geographic distribution, and the ecological significance of plasmids in the deep sea.

[from SSIE No. CM-310-2]

Status: A deep-ocean sampler has been designed, constructed, and successfully used on a number of cruises. Present work is geared towards studying microorganisms capable of growing under hydrostatic pressure and low temperature.

Information Source: R.R. Colwell, address above.

2. Physical and Chemical Processes

79C-R079
PETROLEUM HYDROCARBONS IN THE SEDIMENTS OF THE BERMUDA PLATFORM
Principal Investigator: Butler, J.
Performing Organization: Harvard University, School of Arts & Sciences, Cambridge Station, Cambridge, MA 02138 and Bermuda Biological Station for Research, St. Georges West, Bermuda
Supporting Organization: US National Science Foundation, Division of Ocean Sciences, 1800 G St. N.W., Washington, DC 20550
Period: 11/77 - 5/80
Funds: $68,425

Hydrocarbons, Fate, Distribution, Sediments, Tar, Models, Bermuda

The objectives of this research are to 1) determine the long-term fate of petroleum residues by measuring the concentration and chemical composition of hydrocarbons in the sediments on a transect from intertidal zones to the abyssal depths, 2) estimate the rate of sedimentation of petroleum residues, and 3) relate these data to a model for dispersion of particulate hydrocarbons in the oceanic water column. The research is being conducted in Bermuda.

Status: Preliminary results have eliminated rapid bioturbation or totally quiescent deposition on a stable sedimentary facies as probable mechanisms for transport and sedimentation within the sediment. Degradation in the sediment has not been eliminated as a hypothesis.

Reports and Publications

THE LARGEST OIL SPILLS: INCONSISTENCIES AND INFORMATION GAPS
Butler, J.N. 1978.
Ocean Industry 13(10):101-112.

MARINE POLLUTION: HOW BIG A PROBLEM (INPUTS AND FATE OF PETROLEUM TO THE MARINE ENVIRONMENT)
Butler, J.N. 1979.
Proceedings of the Conference on Oil Tanker Transportation, Georgetown, South Carolina, 8-10 November 1978. In press.

LONG-TERM FATE OF PETROLEUM HYDROCARBONS AFTER SPILLS--COMPOSITIONAL CHANGES AND MICROBIAL DEGRADATION
Butler, J.N., and E.M. Levy. 1978.
Journal of the Fisheries Research Board of Canada 35(5):604-605.

PETROLEUM RESIDUES: HAS THE AMOUNT OF TAR ON THE OPEN OCEAN CHANGED IN THE PAST DECADE?
Knap, A.H., T.M. Iliffe, and J.N. Butler. 1979.
Submitted to Science, June 1979.

METHODS FOR IDENTIFYING THE SOURCE OF SPILLED OIL
Sleeter, T.D. 1978.
Harvard Environmental Law Review, Vol. 2:514-522.

OIL SPILL IN BERMUDA: A CASE STUDY OF EFFECTIVE LITIGATION
Sleeter, T.D., and J.N. Butler. 1978.
Environmental Conservation 5(1):21-24.

HYDROCARBONS IN SEDIMENTS FROM THE EDGE OF THE BERMUDA PLATFORM
Sleeter, T.D., J.N. Butler, and J.E. Barbash. 1979.
1979 Oil Spill Conference (Prevention, Behavior, Control, Cleanup), Los Angeles, 19-22 March 1979. Washington, DC, American Petroleum Institute, 1979. p. 615-620. (API Publication No. 4308.)

HYDROCARBONS IN THE SEDIMENTS OF THE BERMUDA REGION: LAGOONAL TO ABYSSAL DEPTHS
Sleeter, T.D., J.N. Butler, and J.E. Barbash. 1979.
Advances in Chemistry Series. In press.

RELATIONSHIP BETWEEN AROMATIC HYDROCARBONS AND PELAGIC TAR IN THE MEDITERRANEAN SEA, 1974-75
Zsolnay, A., B.F. Morris, and J.N. Butler. 1978.
Environmental Conservation 5(3):295-297.

Information source: J.N. Butler, Pierce Hall, Harvard University, 29 Oxford St., Cambridge, MA 02138.

79C-R080 (R-139-78)
NAVY ENVIRONMENT: CHEMISTRY OF DISSOLVED ORGANIC MATTER AND ITS INTERACTION WITH TRANSITION METALS IN SEAWATER

Principal Investigators:	Quinn, J.G., and D.R. Kester
Performing Organization:	Univeristy of Rhode Island, Narragansett, Marine Lab., Narragansett, RI 02882
Supporting Organization:	US Dept. of Defense, Navy, Office of Naval Research, 800 N. Quincy St., Arlington, VA 22217
Period:	9/75 - Cont.
Funds:	$42,000 FY 79

Hydrocarbons, Seawater, Fate, Solubility, Chemical analysis

This research will elucidate the role of dissolved organic matter (DOM) in chemical oceanic phenomena,which include the solubilization of hydrocarbons, related to naval operational problems. DOM will be isolated, analyzed, and tested for its interactions with certain trace elements. [possibly oil pollution related]

[from SSIE No. GQN-675078-2]

3. Models, Simulations, and Predictions

79C-R081
INVESTIGATION OF TRANSIENTS IN RIVERS

Principal Investigator:	Fread, D.L.
Performing Organization:	US Dept. of Commerce, NOAA, National Weather Service, Office of Hydrology, Silver Spring, MD 20910
Supporting Organization:	Same
Period:	10/77 - 9/79
Funds:	N/A

Models, Spill trajectories, Movement, Dispersion, Rivers

A portion of this project is concerned with the development of a one-dimensional hydrodynamic-dispersion model to forecast the transport of oil spills in rivers.

[from SSIE No. ZBP-1292-1]

79C-R082

ALASKA NUMERICAL MODELING

Principal Investigator:	Galt, J.A.
Performing Organization:	US Dept. of Commerce, NOAA, Pacific Marine Environmental Lab., 2725 Montlake Blvd. E., Seattle, WA 98112
Supporting Organization:	US Dept. of the Interior, BLM, 19th & C Sts. N.W., Washington, DC 20240
Period:	1975 - 1978
Funds:	$150,000 FY 78

Models, Hydrocarbons, Distribution, Movement, Oil-gas leasing, Alaska

The goal of this research is to describe, synthesize, and communicate observational and theoretical results on the distribution and movement of hydrocarbon pollutants in areas identified for potential oil and gas development. The study is part of a larger oil spill project being conducted at the Pacific Marine Environmental Laboratory.

[from SSIE No. GUK-209]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT, AND PRODUCTION

1. Biological Aspects

79C-R083
EFFECT OF DISTURBANCE OF FOREST HABITAT BY OIL EXPLORATION ON ELK
Principal Investigator: McCullough, D.R.
Performing Organization: University of Michigan, School of Natural Resources, Ann Arbor, MI 48104
Supporting Organization: Michigan State Government, 3500 N. Logan St., Lansing, MI 48906
Period: 10/77 - 9/78
Funds: N/A

Drilling, Development, Onshore impacts, Habitats, Animals, Distribution, *Elk

The impact of oil exploration and development on the movements and distribution of elk in the Pigeon River State Forest will be determined. Signals from radio-collared individuals will provide short-term information on elk movements while track and pellet counts will provide long-term information. Changes in the forest habitat and oil-drilling activities will be related to animal movement.

[from SSIE No. GY-72470]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER, AND STORAGE

1. Storage

79C-R084 (R-084-78)
US NAVY OILY WASTE HANDLING PROGRAM: DEVELOPMENT OF LEGAL COST EFFECTIVE BULK FUEL STORAGE TANK STRIPPING SYSTEM

Principal Investigator:	Strandell, P.A.
Performing Organization:	David Taylor Naval Ship Research & Development Center, Annapolis, MD 21402
Supporting Organization:	US Dept. of Defense, Navy, Naval Supply Systems Command, Washington, DC 20376
Period:	3/76 - 12/79
Funds:	$145,000 FY 79

Storage, Fuel oil, Wastewater treatment, Pollution prevention, Equipment

This research proposes to develop an automated system that will purge fuel storage tanks of water and dirt to Navy-acceptable levels, separate oil from the effluent for reclamation and legally discharge the water and dirt to the environment in a cost-effective manner.

[from SSIE No. ZQN-778141-2]

Status: Lining of a test tank has been completed. Construction of a stripping system has begun and is expected to be completed by 1 December 1979.

Reports and Publications

SURVEY OF DIESEL FUEL MARINE BULK STORAGE FACILITIES
Taylor, J.W. 1977.
Report MAT-77-25. __ p.

Information source: P.A. Strandell, address above.

G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL

1. Waste Treatment and Disposal Methods

79C-R085
WASTEWATER QUALITY IMPROVEMENT USING MICRO-GAS-DISPERSION STRIPPING

Principal Investigators:	Shaler, A.J., J. Keane, and F. Sebba
Performing Organization:	Buchart Horn, Inc., 612 W. Market St., PO Box M-55, York, PA 17405
Supporting Organization:	US Dept. of the Interior, Office of Water Research & Technology, 18th & C Sts. NW, Washington, DC 20240
Period:	9/78 - 4/79
Funds:	$85,473 FY 78

Wastewater treatment, Recycling, Equipment, Performance testing, *Micro-Gas-Dispersion stripping

The Micro-Gas-Dispersion stripping system will be field-tested on several types of waste with the objective of release and recycling of the water. The system selectively removes contaminants including oil.

[from SSIE No. GUY-1538]

Guide to the Master List of Keywords and the Subject Keyword Index

The following Master List of Keywords is a controlled list of approximately 400 scientific, technical, geographic, and other descriptive terms relevant to the field of oil pollution. For each literature abstract and research project summary contained in this issue, a string of several terms has been selected from this list to serve as a reference guide to each entry. The Master List is continually updated to reflect common word usage and current trends in oil pollution literature and research. When necessary, additional free-language terms are assigned to more thoroughly define the subject coverage of an entry; such terms are preceded by an asterisk (*).

The terms included in the Master List are alphabetically permuted by computer to form the Subject Keyword Index. Thus, the string of keywords for each abstract is listed in all possible alphabetical arrangements to provide rapid access to, and cross-referencing of, any entry in this issue. The free-language terms (*) are not alphabetically permuted.

To effectively use the permuted Subject Keyword Index, the reader should use the following procedure: 1) Scan the Master List of Keywords and Cross-Reference Guide to determine all possible terms and word variants applicable to the topic of interest; 2) look up all terms in the permuted Subject Keyword Index and scan the other keywords in each entry to determine the relevancy of the entry; 3) note the citation numbers of relevant entries and locate them in the body of the ABSTRACTS. Citation numbers prefixed with the letter R denote research project summaries.

MASTER LIST OF KEYWORDS AND CROSS-REFERENCE GUIDE TO RELATED TERMS

S: See
SA: See also

- Absorption
  - SA: Adsorption, Sorbents
- Activated sludge
  - SA: Biological treatment, Sludge, Solid wastes
- Acute effects
  - SA: Biological effects, Mortality, Toxicity
- Adsorption
  - SA: Absorption, Sorbents
- Africa
- Air-Sea interface
  - S: Sea surface
- Alabama
- Alaska
  - SA: Gulf of Alaska
- Algae
  - SA: Phytoplankton
- Amoco Cadiz spill
  - SA: France
- Analytical techniques
  - SA: Bioassay, Chemical analysis, Chromatography, Concentrations, Detection, GC/MS, Source identification, Spectrometry, Spectroscopy
- Animals
  - SA: Birds, Invertebrates, Marine mammals, Marine organisms, Vertebrates, Wildlife
- Annelids
  - SA: Invertebrates, Marine organisms, Polychaetes
- Antarctica
- API (American Petroleum Institute)
- Aquatic environment
  - S: Freshwater, Lakes, Marine environment, Rivers, Sea surface
- Arctic
  - SA: Ice, Subarctic regions
- Arctic Ocean
- Argentina
- Argo Merchant spill
- Aromatic hydrocarbons
  - SA: Hydrocarbons, PAH
- Atlantic coast
- Atlantic Ocean
- Australia
- Bacteria
  - SA: Microorganisms
- Bahamas
- Ballast
- Baltic Sea
  - SA: Segregated ballast, Tankers, Wastewater treatment
- Barents Sea
- Baseline studies
  - SA: EIS
- Bays
  - SA: Coastal waters, Estuaries, Harbors
- Beach cleanup
  - SA: Spill cleanup
- Beaches
  - SA: Coasts, Intertidal zone, Sediments, Shorelines
- Beaufort Sea
- Behavior
  - SA: (Physical) Dispersion, Drift, Fate, Models, Movement, Predictions, Simulations, Spreading
  - SA: (Biological) Bioassay, Biological effects, Development, Growth, Toxicity
- Benthos
  - SA: Invertebrates, Marine organisms
- Bering Sea
- Bermuda
- Bibliographies
- Bilges
  - S: Ballast, Ships, Tankers
- Bioassay
  - SA: Analytical techniques
- Biodegradation
  - SA: Bacteria, Microorganisms
- Biogenic hydrocarbons

SA: Hydrocarbons
Bioindicators
SA: Detection
Biological effects
SA: Acute effects, Chronic effects, Sublethal effects, Toxicity
Biological treatment
SA: Wastewater treatment
Biomass
Birds
SA: Animals, Vertebrates, Wildlife
Black Sea
SA: USSR
BLM (Bureau of Land Management)
SA: Government agencies, US government
Blowout prevention
Blowouts
Book review
Booms
SA: Design-engineering, Equipment, Spill containment
Bouchard 65 spill
SA: Buzzards Bay
Brazil
Burning
SA: Incineration
Buzzards Bay
SA: Massachusetts
California
SA: Pacific coast
Canada
Carcinogens
SA: Health hazards, Mutagens, PAH
Caribbean Sea
Caspian Sea
SA: USSR
Chemical analysis
SA: Analytical techniques, Chromatography, Detection, GC/MS, Source identification, Spectrometry, Spectroscopy
Chemical effects
Chesapeake Bay
SA: Delaware, Maryland
Chile
China
Chromatography
SA: Analytical techniques, Chemical analysis, GC/MS
Chronic effects
SA: Biological effects, Toxicity
Coalescence
SA: Flocculation, Wastewater treatment
Coastal waters
SA: Atlantic coast, Bays, Coasts, Harbors, Pacific coast
Coastal zone management
SA: Environmental management, Resource management
Coasts
SA: Bays, Beaches, Coastal waters, Harbors, Ports, Shorelines
Cold Climates
SA: Arctic, Arctic Ocean, Subarctic regions
Compensation
SA: Insurance, Liability
Concentrations
SA: Analytical techniques, Chemical analysis, Chromatography, Detection
Connecticut
Conservation
SA: Coastal zone management, Environmental management, Resource management
Containment
S: Booms, Equipment, Spill cleanup, Spill containment
Contamination
Contingency planning
SA: Spill cooperatives, Spill response
Coral reefs
Cost analysis
SA: Economics, Economic effects
Crankcase oil
SA: Lubricating oil
Crude oil
SA: Aromatic hydrocarbons, Hydrocarbons
Crude oil washing
SA: Ballast, Oil discharges, Segregated ballast, Tankers
Crustaceans
SA: Invertebrates, Marine organisms

Deepwater ports
Degradation
  SA: Biodegradation
  SA: Harbors, Oil terminals, Ports
Delaware
Delaware Bay
Demulsification
Denmark
Depuration
  S: Uptake
Design-engineering
  SA: Equipment, Patent, Performance testing, Product information
Detection
  SA: Analytical techniques, Bioindicators, Chemical analysis, Monitoring, Remote sensing, Source identification, Surveillance
Development
  SA: (Oil) Drilling, Exploration, Offshore, Production;
  SA: (Biological) Behavior, Biological effects, Growth, Metabolism
Diesel fuel
  S: Fuel oil
Dispersants
  SA: Emulsifiers, Spill cleanup, Surfactants
Dispersion
  SA: Behavior, Drift, Movement, Spreading
Disposal
  SA: Waste oil, Wastewaters
Distribution
  SA: Concentrations, Hydrocarbons
DOE (Department of Energy)
  SA: Government agencies, US government
Drift
  SA: Behavior, Dispersion, Models, Movement, Simulations, Spreading
Drilling
  SA: Exploration, Offshore, Oil fields, Oil wells, Platforms
Echinoderms
  S: Invertebrates, Marine organisms
Economic effects
  SA: Socioeconomic effects
Economics
  SA: Cost analysis
Ecosystems
  SA: Food web, Habitats, Niches
Ecuador
Effluents
  S: Wastewaters
Effluent treatment
  S: Wastewater treatment
EIS (Environmental Impact Statement)
  SA: Baseline studies
Ekofisk blowout
Emulsification
  SA: Dispersants, Surfactants
Emulsions
Engineering
  S: Design-engineering
England
  S: UK
English Channel
Environmental effects
Environmental Impact Statement
  S: Baseline studies, EIS
Environmental management
  S: Coastal zone management, Resource management
Environmental protection
  S: Pollution control, Pollution prevention
EPA (Environmental Protection Agency)
  SA: Government agencies, US government
Equipment
  SA: Booms, Patents, Product information, Skimmers, Spill cleanup
ERDA (Energy Research and Development Administration)
  SA: DOE, Government agencies, US government
Estuaries
  SA: Bays
Europe
Evaporation
Exploration
  SA: Development, Drilling, Offshore, Production
Extraction
  SA: Oil shale, Production,

Tar sands
Fate
SA: Behavior, Drift, Spreading
FEA (Federal Energy Administration)
SA: DOE, ERDA, Government agencies, US government
Field testing
S: Performance testing
Filtration
SA: Flocculation, Wastewater treatment
Fingerprinting
S: Source identification
Finland
Fish
SA: Vertebrates, Marine organisms
Fisheries
Flocculation
SA: Coalescence, Filtration, Wastewater treatment
Florida
Florida spill
Flotation
SA: Oil-water separation, Wastewater treatment
Food chain
S: Food web
Food web
Foreign governments
SA: Government agencies
Fossil fuels
SA: Crude oil
France
Freshwater
SA: Groundwater, Lakes, Rivers, Water quality
Fuel oil
Fuels
S: Fossil fuels, Fuel oil, Gasoline, Petroleum products
Fungi
SA: Microorganisms
Gas-liquid chromatography
S: Chemical analysis, Chromatography
Gasoline
SA: Fuel oil
GC/MS (Gas chromatography/Mass spectrometry)
SA: Analytical techniques, Chemical analysis, Chromatography, Spectrometry
Georges Bank
SA: Atlantic Ocean, OCS
Georgia
Germany
Government agencies
SA: BLM, DOE, EPA, ERDA, FEA, NOAA, USCG, USGS, USN; Foreign governments, State governments, US government
Gravity separation
SA: Oil-water separation, Wastewater treatment
Great Britain
S: UK
Great Lakes
Greenland
Groundwater
SA: Freshwater, Water quality
Growth
SA: Behavior, Development, Metabolism
Guidelines
SA: Manuals, Regulations
Gulf of Alaska
SA: Alaska
Gulf of Mexico
SA: Mexico
Habitats
SA: Ecosystems
Harbors
SA: Bays, Coastal waters, Deepwater ports, Oil terminals, Ports
Health hazards
SA: Carcinogens
Hydrocarbons
SA: Aromatic hydrocarbons, Biogenic hydrocarbons, Crude oil, PAH, WSF
Ice
SA: Arctic, Subarctic regions
Illinois
IMCO (International Maritime Consultative Organization)
SA: International agreements
Incineration
SA: Burning, Waste oil treatment
India
Indian Ocean
Indonesia
Industries
SA: Oil industry, Petrochemicals

- Information systems
- Infrared spectroscopy
  - S: Analytical techniques, Spectroscopy
- Insurance
  - SA: Compensation, Liability
- International agreements
  - SA: Foreign governments
- International conventions
  - SA: Foreign governments, Legislation, Regulations
- Intertidal zone
  - SA: Beaches, Coastal Waters, Shorelines
- Invertebrates
  - SA: Benthos, Crustaceans, Echinoderms, Marine organisms, Mollusks
- Iran
- Ireland
  - SA: UK
- Israel
- Italy
- Japan
- Kuwait
- Labrador Sea
- Lakes
  - SA: Freshwater, Great Lakes
- Land farming
  - SA: Waste oil disposal
- Land spills
  - SA: Leakage, Onshore, Onshore impacts, Pipelines
- Law enforcement
  - SA: Legislation, Regulations, Surveillance
- Leakage
  - SA: Oil discharges
- Legislation
  - SA: International conventions, Law enforcement Regulations
- Liability
  - SA: Compensation, Insurance, Law enforcement
- Lightering
  - S: Oil transfer, Ships, Tankers
- Louisiana
- Lubricating oil
  - SA: Crankcase oil
- Maine
- Manuals
  - SA: Guidelines
- Marine environment
  - SA: Offshore, Sea surface, Seawater
- Marine mammals
  - SA: Animals, Vertebrates, Wildlife
- Marine organisms
  - SA: Animals, Annelids, Crustaceans, Echinoderms, Fish, Invertebrates, Microorganisms, Mollusks, Vertbrates
- Marshes
- Maryland
- Massachusetts
- Mass spectrometry
  - S: GC/MS, Spectrometry
- Mass spectroscopy
  - S: Spectroscopy
- Mediterranean Sea
- Metabolism
  - SA: Growth, Release, Uptake
- Metula spill
  - SA: Strait of Magellan
- Mexico
  - SA: Gulf of Mexico
- Michigan
  - SA: Great Lakes
- Microorganisms
  - SA: Algae, Bacteria, Biodegradation, Fungi, Yeasts
- Mississippi
- Mississippi River
- Models
  - SA: Behavior, Predictions, Simulations, Spill trajectories
- Mollusks
  - SA: Invertebrates, Marine organisms
- Monitoring
  - SA: Detection, Remote sensing, Sampling, Surveillance
- Mortality
  - SA: Acute effects, Toxicity
- Motor oil
  - S: Crankcase oil
- Mousse
  - S: Emulsions, Emulsification
- Movement
  - SA: Behavior, Drift, Spreading
- Mutagens
  - SA: Carcinogens, Health hazards

Narragansett Bay
  SA: Massachusetts
Natural seepage
  SA: Santa Barbara Channel
New Jersey
New York
Niches
  S: Ecosystems, Habitats
NOAA (National Oceanic and Atmospheric Adminstration)
  SA: Government agencies, US government
North Carolina
North Sea
Norway
Oceans
  SA: Arctic Ocean, Atlantic Ocean, Indian Ocean, Marine environment, Pacific Ocean
OCS (Outer Continental Shelf)
  SA: Development, Drilling, Exploration, Offshore, Oil fields, Oil-gas leasing, Production
Offloading
  S: Oil transfer, Ships, Tankers
Offshore
  SA: Development, Drilling, Exploration, OCS, Oil fields, Oil-gas leasing, Oil wells, Platforms, Production
Oil
  S: Crankcase oil, Crude oil, Fossil fuels, Fuel oil, Lubricating oil, Oil shale, Petroleum products, Residual oils, Tar, Tar sands, Waste oil, WSF
Oil discharges
  SA: Leakage
Oil fields
  SA: Offshore, Platforms, Production
Oil-gas leasing
  SA: Development, Drilling, OCS, Offshore, Production
Oil industry
  SA: Industries, Petrochemicals, Refineries
Oil removal
  SA: Pollution control, Spill cleanup, Spill removal
Oil sands
  S: Tar sands
Oil shale
  SA: Extraction
Oil slicks
Oil spills
  SA: Spill cleanup, Spill containment, Spill disposal, Spill removal, Spill response
Oil tanks
  SA: Storage
Oil terminals
  SA: Deepwater ports, Harb[illegible] Oil transfer, Ports
Oil [illegible]ansfer
  SA: Harbors, Ports
Oil transport
  SA: Pipelines, Tankers
Oil-water separation
  SA: Gravity separation, Waste oil treatment, Wastewater treatment
Oil wells
  SA: Drilling, Offshore, Oil fields, Production
Olympic Games spill
Onshore
  SA: Land spills
Onshore impacts
Oregon
Oxidation
  SA: Biodegradation, Weathering
Pacific coast
Pacific Ocean
PAH (Polycyclic aromatic hydrocarbons)
  SA: Aromatic hydrocarbons, Hydrocarbons
Patent
  SA: Design-engineering, Equipment
Pennsylvania
Performance testing
  SA: Design-engineering, Equipment, Product information
Persian Gulf
Personnel training
  SA: Contingency planning, Spill response
Petrochemicals

Petroleum
  S: Hydrocarbons, Petroleum products
Petroleum industry
  S: Oil industry, Refineries
Petroleum products
  SA: Crankcase oil, Fuel oil, Fuels, Gasoline, Lubricating oil
Philippines
Physical aspects
Physical effects
  SA: Behavior, Drift, Movement
Phytoplankton
  SA: Algae, Microorganisms, Plankton
Pipelines
  SA: Oil transfer, Oil transport, Trans-Alaska Pipeline
Plankton
  S: Microorganisms, Phytoplankton, Zooplankton
Plants
  SA: Vegetation
Platforms
  SA: Drilling, Exploration, Offshore, Production, Oil wells
Pollution control
Pollution prevention
  SA: Environmental protection, Contingency planning
Polychaetes
  S: Annelids, Invertebrates, Marine organisms
Ports
  SA: Deepwater ports, Harbors, Oil terminals
Portugal
Predictions
  SA: Models, Simulations, Spill trajectories
Product information
  SA: Design-engineering, Equipment, Performance testing
Production
  SA: Development, Drilling, Exploration, Offshore
Prudhoe Bay
  SA: Alaska, Gulf of Alaska
Puerto Rico
Puget Sound
  SA: Washington
Reclamation
  SA: Recycling, Reuse
Recovery
  SA: Restoration
Recycling
  SA: Reclamation, Reuse
Red Sea
Refineries
  SA: Oil industry
Refining
Regulations
  SA: Government agencies, Guidelines, International agreements, International conventions, Legislation
Release
  S: Depuration
Remote sensing
  SA: Detection, Monitoring, Source identification, Surveillance
Reproduction
Residual oils
  S: Tar, Waste oil
Resource management
  SA: Coastal zone management
Restoration
  SA: Recovery
Reuse
  SA: Reclamation, Recycling
Rhine River
  SA: Germany, Mediterranean Sea
Rhode Island
Risk analysis
  SA: Economics, Statistical analysis, Statistics
Rivers
  SA: Freshwater, Onshore
Russia
  S: USSR
Safety
  SA: Health hazards
Sampling
  SA: Detection, Monitoring, Source identification
San Francisco Bay
  SA: California
Sansinena spill
Santa Barbara Channel
  SA: California

- Sargasso Sea
  - S: Atlantic Ocean
- Scotland
  - SA: UK
- Seabirds
  - S: Birds
- Sea surface
- Seawater
  - SA: Marine environment, Sea surface
- Sedimentation
- Sediments
  - SA: Soil
- Segregated ballast
  - SA: Ballast, Crude oil washing, Tankers
- Ships
  - SA: Tankers
- Shorelines
  - SA: Beaches, Coasts
- Simulations
  - SA: Models, Predictions
- Sinking agents
- Skimmers
  - SA: Design-engineering, Equipment, Spill cleanup
- Sludge
  - SA: Activated sludge, Solid wastes
- Socioeconomic effects
  - SA: Economic effects
- Soil
  - SA: Sediments
- Solid wastes
  - SA: Disposal, Sludge
- Solubility
- Solution
- Solvents
  - S: Dispersants, Emulsifiers
- Sorbents
  - SA: Absorption, Adsorption
- Source identification
  - SA: Detection, Monitoring, Remote sensing, Sampling, Surveillance
- Sources
- South Carolina
- Soviet Union
  - S: USSR
- Spain
- Spectrometry
  - SA: Analytical techniques, Chemical analysis, GC/MS
- Spectroscopy
  - SA: Analytical techniques, Chemical analysis
- Spill cleanup
  - SA: Booms, Dispersants, Equipment, Pollution control, Sinking agents, Skimmers, Spill containment
- Spill containment
- Spill cooperatives
  - SA: Contingency planning, Spill cleanup, Spill response
- Spill disposal
- Spill removal
- Spill response
  - SA: Contingency planning, Spill cleanup, Spill cooperatives
- Spill trajectories
  - SA: Drift, Models, Movement, Predictions
- Spreading
  - SA: Behavior, Drift, Models, Movement, Oil slicks
- St. Lawrence River
  - SA: Great Lakes
- State governments
  - SA: Government agencies, Regulations
- Statistical analysis
- Statistics
- Storage
  - SA: Oil tanks
- Strait of Magellan
  - SA: Chili
- Strategic Petroleum Reserve
- Streams
  - S: Freshwater, Onshore, Rivers
- Subarctic regions
  - SA: Arctic, Cold climates
- Sublethal effects
  - SA: Biological effects, Toxicity
- Superports
  - S: Deepwater ports, Oil terminals, Ports
- Supertankers
  - S: Tankers
- Surfactants
  - SA: Dispersants, Emulsifiers

- Surveillance
  - SA: Law enforcement, Monitoring, Remote sensing
- Sweden
- Tank farms
  - S: Oil tanks, Storage
- Tankers
  - SA: Oil transport, Ships
- Tar
  - SA: Residual oils
- Tar sands
- Testing
  - S: Performance testing
- Texas
- Torrey Canyon spill
- Toxicity
  - SA: Acute effects, Biological effects
- Trans-Alaska Pipeline
  - SA: Alaska, Pipelines
- Tropical regions
- UK (United Kingdom)
- Ultrafiltration
  - S: Filtration
- UN (United Nations)
  - SA: International agreements, International conventions
- Uptake
  - SA: Growth, Metabolism, Release
- Urquiola spill
  - SA: Spain
- US (United States)
- USCG (US Coast Guard)
- US Government
  - SA: Government agencies
- USGS (US Geological Survey)
  - SA: Government agencies, US government
- USN (US Navy)
- USSR (Union of Soviet Socialist Republics)
- Vegetation
  - SA: Plants
- Venezuela
- Vertebrates
  - SA: Animals, Birds, Marine mammals, Marine organisms
- Virgin Islands
- Virginia
- Washington
- Waste oil
  - SA: Disposal, Reclamation, Recycling, Residual oils
- Waste oil treatment
- Wastewaters
- Wastewater treatment
  - SA: Oil-water separation
- Waterfowl
  - S: Birds
- Water quality
  - SA: Freshwater, Groundwater
- Water soluble fraction
  - S: WSF
- Weathering
- Wildlife
  - SA: Animals, Birds, Marine organisms, Marine mammals
- WSF (Water soluble fraction)
  - SA: Crude oil, Hydrocarbons, Solution
- Yeasts
  - SA: Microorganisms
- Zooplankton
  - SA: Microorganisms, Plankton

0798	ABSORPTION, SPILL REMOVAL, SORBENTS, POLLUTION CONTROL,*CEDAR WASTE
1103	" OIL-WATER SEPARATION, PATENT
0845	ACUTE EFFECTS, HYDROCARBONS , CHRONIC EFFECTS, TOXICITY, MORTALITY, BIRDS, WILDLIFE, ANALYTICAL TECHNIQUES
0853	" CRUDE OIL, HYDROCARBONS , WSF, FISH, CRUSTACEANS, MORTALITY, TOXICITY, *TEMPERATURE EFFECTS
0877	" HYDROCARBONS , WSF, MARINE ORGANISMS, TOXICITY, SUBLETHAL EFFECTS, RECOVERY, ALASKA
0781	ADSORPTION, OIL-WATER SEPARATION, SORBENTS, AROMATIC HYDROCARBONS
0803	" SPILL CLEANUP, EMULSIONS, SORBENTS, PATENT
1087	" WASTEWATER TREATMENT, OIL SLICKS, SORBENTS, PATENT
1095	" WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT, *FERRITE POWDER
1096	" WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT, *FERRITE POWDER
0936	AFRICA, OIL SPILLS, ENVIRONMENTAL EFFECTS, RECOVERY, CHRONIC EFFECTS, TANKERS, *VENPET-VENOIL SPILL
0712	ALASKA , HYDROCARBONS , BIOGENIC HYDROCARBONS, DISTRIBUTION, NATURAL SEEPS, MONITORING, OCS, BASELINE STUDIES
0770	" SPILL REMOVAL, SPILL CLEANUP, SORBENTS, COLD CLIMATES, ICE, OIL TANKS
0795	" BURNING, CRUDE OIL, ENVIRONMENTAL EFFECTS, PLANTS, SOIL, RECOVERY, GROWTH
0836	" HYDROCARBONS , BENTHOS, MARINE ORGANISMS, SEDIMENTS, UPTAKE, OCS, *DEPOSIT-FEEDERS
0865	" CRUDE OIL, AROMATIC HYDROCARBONS, SUBLETHAL EFFECTS, RESPIRATION, *HEART RATE, *NAPHTHALENE, *BENZENE, *PARALITHODES CAMTSCHATICA
0867	" CRUDE OIL, BIOLOGICAL EFFECTS, FUNGI, *TUNDRA
0869	" CRUDE OIL, BIOLOGICAL EFFECTS, TOXICITY, *AQUATIC INSECTS, *TUNDRA
0872	" CRUDE OIL, BIOLOGICAL EFFECTS, ZOOPLANKTON, TOXICITY, BIOASSAY, ARCTIC
0875	" CRUDE OIL, PETROLEUM PRODUCTS, BIRDS, TOXICITY, MORTALITY, *HATCHING, *LARUS GLAUCESCENS
0877	" ACUTE EFFECTS, HYDROCARBONS , WSF, MARINE ORGANISMS, TOXICITY, SUBLETHAL EFFECTS, RECOVERY
0679	" CRUDE OIL, BIOLOGICAL EFFECTS, OIL SPILLS, MICROORGANISMS, *TUNDRA
0880	" CRUDE OIL, BIOLOGICAL EFFECTS, BACTERIA, SOIL, FUNGI, YEASTS, TOXICITY, CHRONIC EFFECTS, BIODEGRADATION, SUBARCTIC REGIONS
0888	" CRUDE OIL, BIOLOGICAL EFFECTS, PLANTS, TOXICITY, RECOVERY, CONTINGENCY PLANNING, *DIESEL OIL
0895	" CRUDE OIL, VEGETATION, SOIL, TOXICITY, RECOVERY, CHRONIC EFFECTS, *TUNDRA
0909	" BASELINE STUDIES, FISH, CARCINOGENS, HEALTH HAZARDS, OCS, BERING SEA, *PATHOLOGY
0912	" HYDROCARBONS , BIOGENIC HYDROCARBONS, DISTRIBUTION, SEDIMENTATION, OCS, BASELINE STUDIES, BEAUFORT SEA
0925	" CRUDE OIL, ENVIRONMENTAL EFFECTS, TOXICITY, BIODEGRADATION, *PROCEEDINGS
0926	" CRUDE OIL, ENVIRONMENTAL EFFECTS, PHYSICAL EFFECTS, CHEMICAL EFFECTS, SOIL, SUBARCTIC REGIONS, *TUNDRA
0930	" CRUDE OIL, BIOLOGICAL EFFECTS, PHYSICAL EFFECTS, CHEMICAL EFFECTS, SOIL, CHRONIC EFFECTS, PLANTS, MORTALITY, RECOVERY, *BLACK SPRUCE, *TUNDRA
0959	" BIODEGRADATION, CRUDE OIL, BIOLOGICAL EFFECTS, SOIL, PLANTS
0994	" CRUDE OIL, FUEL OIL, SOIL, FATE, BIODEGRATION, SUBARCTIC REGIONS
1040	" TANKERS, DEEPWATER PORTS, POLLUTION PREVENTION, SAFETY, *VALDEZ NARROWS
1052	" PIPELINES, SOCIOECONOMIC EFFECTS, TRANS-ALASKA PIPELINE
1071	" POLLUTION PREVENTION, OIL TRANSPORT, ENVIRONMENTAL EFFECTS, TANKERS, TRANS-ALASKA PIPELINE
R082	" MODELS, HYDROCARBONS , DISTRIBUTION, MOVEMENT, OIL-GAS LEASING
0870	ALGAE, CRUDE OIL, WSF, BIOLOGICAL EFFECTS, MARINE ENVIRONMENT, *DUNALLIELA TERTIOLECTA
0767	AMOCO CADIZ SPILL, SPILL REMOVAL, SKIMMERS, EQUIPMENT
0791	" SPILL REMOVAL, EQUIPMENT, DESIGN-ENGINEERING, *OIL MOP
0685	ANALYTICAL TECHNIQUES, DETECTION, HYDROCARBONS , REFINERIES, *PROCEEDINGS
0690	" MONITORING, CONTAMINATION, UPTAKE, TOXICITY, FISH, *BIOPSY
0697	" REMOTE SENSING, MONITORING, DETECTION, *AIRBORNE LASER
0698	" REMOTE SENSING, MONITORING, DETECTION, SOURCE IDENTIFICATION, *SPECTRAL SIGNATURES
0706	" PAH, DETECTION, CHROMATOGRAPHY
0707	" PAH, DETECTION, SAMPLING, CHROMATOGRAPHY, SEDIMENTS, FRESHWATER
0709	" SOURCE IDENTIFICATION, OIL SPILLS, SOURCES, NORWAY
0711	" HYDROCARBONS , CHROMATOGRAPHY, NOAA
0713	" SAMPLING, DETECTION, *OIL-IN-WATER ANALYSIS
0715	" MUTAGENS, PAH, CRUDE OIL, MICROORGANISMS, *SALMONELLA TYPHIMURIUM/MICROSOMAL ACTIVATION
0716	" CHROMATOGRAPHY, GC/MS, DETECTION, HYDROCARBONS , FRESHWATER, *FLAME IONIZATION, *FLAME PHOTOMETRY
0717	" SOURCE IDENTIFICATION, HYDROCARBONS , DISPERSION
0721	" CRUDE OIL, GC/MS
0722	" PAH, CHROMATOGRAPHY, BIOASSAY, TOXICITY
0723	" PAH, DETECTION, CHROMATOGRAPHY, LAKES , *AIR-WATER INTERFACE, LOUISIANA
0725	" SAMPLING, FISH, HYDROCARBONS , CONCENTRATIONS, OFF SHORE, GULF OF MEXICO, *BUCCANEER OILFIELD, *ALKANES
0730	" AROMATIC HYDROCARBONS, DETECTION, CHROMATOGRAPHY
0734	" DETECTION, *XAD RESINS
0735	" WASTEWATERS, CONTAMINATION, MONITORING, REFINING, *ENZYME INHIBITION SCREENING

0738 ANALYTICAL TECHNIQUES, HYDROCARBONS , *MASS FRAGMENTGRAPHY
0739 " OIL SPILLS, SOURCE IDENTIFICATION, *MULTICOMPONENT FLUORESCENCE
0743 " HYDROCARBONS , DETECTION, PETROLEUM PRODUCTS, CHROMATOGRAPHY, ANIMALS, *RUMINANTS
0744 " AROMATIC HYDROCARBONS, CHROMATOGRAPHY
0747 " SOURCE IDENTIFICATION, OIL SPILLS, MODELS, INFORMATION SYSTEMS, *PATTERN RECOGNITION
0749 " SOURCE IDENTIFICATION, WEATHERING, USCG
0750 " SOURCE IDENTIFICATION, *LUMINESCENCE
0845 " ACUTE EFFECTS, HYDROCARBONS , CHRONIC EFFECTS, TOXICITY, MORTALITY, BIRDS, WILDLIFE
0897 " BASELINE STUDIES, TRANS-ALASKA PIPELINE, OIL TRANSPORT, HYDROCARBONS , GULF OF ALASKA
0922 " ENVIRONMENTAL EFFECTS, MONITORING, REFINERIES, WASTEWATERS, FATE, BEHAVIOR, DEVELOPMENT, POLLUTION CONTROL, HEALTH HAZARDS, *PROCEEDINGS
0929 " SOURCES, FATE, FRESHWATER, MARINE ENVIRONMENT, BIOLOGICAL EFFECTS, *PROCEEDINGS
0967 " CHROMATOGRAHY, SEDIMENTS, TAR, FATE, ARGO MERCHANT SPILL
R072 " SEAWATER, USN
0743 ANIMALS, ANALYTICAL TECHNIQUES, HYDROCARBONS , DETECTION, PETROLEUM PRODUCTS, CHROMATOGRAPHY, *RUMINANTS
0801 " OIL SPILLS, SPILL CLEANUP, ENVIRONMENTAL EFFECTS, MORTALITY, BIRDS, SCOTLAND, *ESSO BERNICIA SPILL
0883 " CONTAMINATION, PLANTS, PETROCHEMICALS
R075 " MUTAGENS, FUEL OIL, BIOASSAY, TOXICITY, BACTERIA, YEASTS
R083 " DRILLING, DEVELOPMENT, ONSHORE IMPACTS, HABITATS, DISTRIBUTION, *ELK
0911 ANTARCTICA,BASELINE STUDIES, MONITORING, MODELS, EIS, ENVIRONMENTAL EFFECTS
1042 API, TANKERS, SAFETY, POLLUTION PREVENTION, PERSONNEL TRAINING, REGULATIONS
0751 ARCTIC, SOURCE IDENTIFICATION, CHEMICAL ANALYSIS, NATURAL SEEPAGE, OIL SLICKS, CANADA
0782 " SPILL CLEANUP, EQUIPMENT, PERFORMANCE TESTING, OIL-WATER SEPARATION
0851 " GASOLINE, BIOLOGICAL EFFECTS, SEDIMENTS, BIODEGRADATION, MICROORGANISMS, CHRONIC EFFECTS, LAKES
0852 " CRUDE OIL, BIOLOGICAL EFFECTS, MICROORGANISMS, SEDIMENTS, BACTERIA, TOXICITY, LAKES
0866 " CRUDE OIL, BIOLOGICAL EFFECTS, PHYTOPLANKTON, LAKES , FRESHWATER
0872 " ALASKA , CRUDE OIL, BIOLOGICAL EFFECTS, ZOOPLANKTON, TOXICITY, BIOASSAY
0934 " FATE, CRUDE OIL, SOIL, BACTERIA, FUNGI, PLANTS, ENVIRONMENTAL EFFECTS, CHRONIC EFFECTS, *TUNDRA
0935 " FATE, CRUDE OIL, SOIL, PHYSICAL EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BACTERIA, FUNGI, PLANTS, CHRONIC EFFECTS, *TUNDRA
0949 " BIODEGRADATION, CRUDE OIL, FERTILIZATION, FRESHWATER, *TUNDRA
0957 " BIODEGRADATION, MICROORGANISMS, BACTERIA, USSR, *MYOBACTERIUM SP.
1010 " DEVELOPMENT, DRILLING, ENVIRONMENTAL EFFECTS, WILDLIFE, LIABILITY, RISK ANALYSIS, CANADA, *LANCASTER SOUND
1024 " MARINE MAMMALS, RESOURCE MANAGEMENT, MODELS, ECOSYSTEMS
1047 " TANKERS, ECONOMICS, RISK ANALYSIS, DESIGN-ENGINEERING, OIL TRANSPORT, *SUBMARINE TANKERS
R077 " BASELINE STUDIES, HYDROCARBONS , CONTAMINATION, COLD CLIMATES
0967 ARGO MERCHANT SPILL, ANALYTICAL TECHNIQUES, CHROMATOGRAHY, SEDIMENTS, TAR, FATE
0730 AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES, DETECTION, CHROMATOGRAPHY
0740 " HYDROCARBONS , PETROLEUM PRODUCTS, SAMPLING, CHEMICAL ANALYSIS, SOLUBILITY, *PARTITION COEFFICIENTS
0744 " ANALYTICAL TECHNIQUES, CHROMATOGRAPHY
0781 " ADSORPTION, OIL-WATER SEPARATION, SORBENTS
0854 " CRUDE OIL, BIOLOGICAL EFFECTS, TOXICITY, MORTALITY, FISH, *ONCORHYNCHUS GORBUSCHA, *EUALUS SPP., *PANDALUS GONIURUS
0856 " UPTAKE, METABOLISM, FISH, *SALMO SALAR L.
0863 " FISH, METABOLISM, CHEMICAL ANALYSIS, CHROMATOGRAPHY
0865 " ALASKA , CRUDE OIL, SUBLETHAL EFFECTS, RESPIRATION, *HEART RATE, *NAPHTHALENE, *BENZENE, *PARALITHODES CAMTSCHATICA
0873 " CRUDE OIL, UPTAKE, DEPURATION, FISH, *ANGUILLA JAPONICA, *SULFUR
0878 " FISH, CRUDE OIL, WSF, TOXICITY, CONTAMINATION, *BIOACCUMULATION
0955 " BIODEGRADATION, FATE, MICROORGANISMS, METABOLISM, *PSEUDOMONAS PXY, *BEIJERINCKIA
0956 " BIODEGRADATION, MICROORGANISMS
0976 " WASTE OIL, TAR, FATE, PHYSICAL ASPECTS, MEDITERRANEAN SEA
0988 " CRUDE OIL, WSF, EVAPORATION, BIODEGRADATION, COLD CLIMATES, CHROMATOGRAPHY, WSF, CRUDE OIL
1016 ATLANTIC COAST, OCS, OIL-GAS LEASING, OFFSHORE, DEVELOPMENT, ENVIRONMENTAL EFFECTS, SOCIOECONOMIC EFFECTS
0691 ATLANTIC OCEAN, HYDROCARBONS , PETROLEUM PRODUCTS, FATE, SEDIMENTS, MOVEMENT, *NEW YORK BIGHT
0917 " BASELINE STUDIES, MARINE ENVIRONMENT, MODELS, PREDICTIONS, BEHAVIOR, OCS, PHYSICAL ASPECTS
0682 BACTERIA, DETECTION, HYDROCARBONS , SHIPS, POLLUTION CONTROL, DESIGN-ENGINEERING, *ENZYME ELECTRODE
0852 " ARCTIC, CRUDE OIL, BIOLOGICAL EFFECTS, MICROORGANISMS, SEDIMENTS, TOXICITY, LAKES
0880 " ALASKA , CRUDE OIL, BIOLOGICAL EFFECTS, SOIL, FUNGI, YEASTS, TOXICITY, CHRONIC EFFECTS, BIODEGRADATION, SUBARCTIC REGIONS

0934 BACTERIA, ARCTIC, FATE, CRUDE OIL, SOIL, FUNGI, PLANTS, ENVIRONMENTAL EFFECTS, CHRONIC EFFECTS, *TUNDRA
0935 " ARCTIC, FATE, CRUDE OIL, SOIL, PHYSICAL EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, FUNGI, PLANTS, CHRONIC EFFECTS, *TUNDRA
0950 " BIODEGRADATION, HYDROCARBONS , BEHAVIOR
0954 " BIODEGRADATION, SPILL CLEANUP, PERFORMANCE TESTING
0957 " ARCTIC, BIODEGRADATION, MICROORGANISMS, USSR, *MYOBACTERIUM SP.
0958 " BIODEGRADATION, HYDROCARBONS , RIVERS, FRESHWATER, *ARTHROBACTER SP.
0960 " BIODEGRADATION, SAMPLING, HYDROCARBONS , FUEL OIL, MICROORGANISMS, FUNGI, SEDIMENTS, BALTIC SEA
0965 " BIODEGRADATION, HYDROCARBONS , SEDIMENTS, COLD CLIMATES
R075 " ANIMALS, MUTAGENS, FUEL OIL, BIOASSAY, TOXICITY, YEASTS
0933 BALLAST , ENVIRONMENTAL EFFECTS, BEACHES, OIL TERMINALS, TANKERS, OIL DISCHARGES, SCOTLAND, *SHETLAND ISLANDS
1037 " OIL SPILLS, TANKERS, SAFETY, PERSONNEL TRAINING, POLLUTION PREVENTION
1046 " TANKERS, OIL DISCHARGES, REGULATIONS, STATISTICS, SOURCES, *ACCIDENTS
1050 " OIL DISCHARGES, TANKERS, SHIPS, OIL SLICKS, MONITORING, EQUIPMENT
1074 " TANKERS, WASTEWATER TREATMENT, OIL REMOVAL, MEDITERRANEAN SEA
1101 " OIL-WATER SEPARATION, TANKERS, SHIPS
0921 BALTIC SEA, OIL SPILLS, WASTEWATERS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, FATE
0944 " ENVIRONMENTAL EFFECTS, INDUSTRIES, PETROLEUM PRODUCTS, OIL SHALE, PRODUCTION, EXTRACTION, DISCHARGES, POLLUTION CONTROL
0960 " BACTERIA, BIODEGRADATION, SAMPLING, HYDROCARBONS , FUEL OIL, MICROORGANISMS, FUNGI, SEDIMENTS
0712 BASELINE STUDIES, ALASKA , HYDROCARBONS , BIOGENIC HYDROCARBONS, DISTRIBUTION, NATURAL SEEPS, MONITORING, OCS
0897 " ANALYTICAL TECHNIQUES, TRANS-ALASKA PIPELINE, OIL TRANSPORT, HYDROCARBONS , GULF OF ALASKA
0908 " HYDROCARBONS , OIL TRANSPORT, CHROMATOGRAPHY, PORTS , PUGET SOUND
0909 " ALASKA , FISH, CARCINOGENS, HEALTH HAZARDS, OCS, BERING SEA, *PATHOLOGY
0912 " ALASKA , HYDROCARBONS , BIOGENIC HYDROCARBONS, DISTRIBUTION, SEDIMENTATION, OCS, BEAUFORT SEA
0913 " FISH, MARINE ORGANISMS, FOOD WEB, PUGET SOUND, *STRAIGHT OF JUAN DE FUCA
0917 " ATLANTIC OCEAN, MARINE ENVIRONMENT, MODELS, PREDICTIONS, BEHAVIOR, OCS, PHYSICAL ASPECTS
1030 " DEVELOPMENT, OIL INDUSTRY, RESOURCE MANAGEMENT, LOUISIANA
R077 " ARCTIC, HYDROCARBONS , CONTAMINATION, COLD CLIMATES
0993 BAYS, HYDROCARBONS , SAMPLING, CHEMICAL ANALYSIS, RIVERS, CONCENTRATIONS, SEDIMENTS, NARRAGANSETT BAY
1038 " OIL SPILLS, TANKERS, ENVIRONMENTAL EFFECTS, SPREADING, SPILL CLEANUP, IRELAND, *BETELGEUSE SPILL
0814 BEACH CLEANUP, CONTINGENCY PLANNING, SPILL RESPONSE, DISPERSANTS, FUEL OIL, POLLUTION PREVENTION, TANKERS
0933 BEACHES, BALLAST , ENVIRONMENTAL EFFECTS, OIL TERMINALS, TANKERS, OIL DISCHARGES, SCOTLAND, *SHETLAND ISLANDS
0964 " BIODEGRADATION, HYDROCARBONS , REFINERIES, WASTEWATERS, CHRONIC EFFECTS, RECOVERY, FRANCE
0912 BEAUFORT SEA, BASELINE STUDIES, ALASKA , HYDROCARBONS , BIOGENIC HYDROCARBONS, DISTRIBUTION, SEDIMENTATION, OCS
0701 BEHAVIOR, REMOTE SENSING, OIL SPILLS, PHYSICAL ASPECTS, SEA SURFACE, PERFORMANCE TESTING, CANADA
0843 " BIOLOGICAL EFFECTS, MARINE ORGANISMS, TOXICITY
0847 " OIL SPILLS, ENVIRONMENTAL EFFECTS, MARINE MAMMALS, MORTALITY, CANADA, *BRITISH COLUMBIA, *ENHYDRA LUTRIS
0917 " BASELINE STUDIES, ATLANTIC OCEAN, MARINE ENVIRONMENT, MODELS, PREDICTIONS, OCS, PHYSICAL ASPECTS
0922 " ANALYTICAL TECHNIQUES,ENVIRONMENTAL EFFECTS, MONITORING, REFINERIES, WASTEWATERS, FATE, DEVELOPMENT, POLLUTION CONTROL, HEALTH HAZARDS, *PROCEEDINGS
0931 " OIL TRANSPORT, EQUIPMENT, LEGISLATION, SPILL RESPONSE, CONTINGENCY PLANNING, POLLUTION PREVENTION, POLLUTION CONTROL, DISPERSANTS, *CONFERENCE
0950 " BACTERIA, BIODEGRADATION, HYDROCARBONS
0968 " OIL SLICKS, EVAPORATION, CONCENTRATIONS, HYDROCARBONS
0986 " OIL SPILLS, MODELS, DRIFT, SPILL TRAJECTORIES, SEA SURFACE, PREDICITIONS
0987 " MODELS, SPILL TRAJECTORIES, DRIFT, NEW YORK
0991 " STATISTICS, ENVIRONMENTAL EFFECTS, FATE, MARINE ENVIRONMENT
0836 BENTHOS, ALASKA , HYDROCARBONS , MARINE ORGANISMS, SEDIMENTS, UPTAKE, OCS, *DEPOSIT-FEEDERS
0838 " OIL SPILLS, TAR SANDS, SLUDGE , FRESHWATER, MORTALITY, TOXICITY, INVERTEBRATES, RIVERS, CANADA
0876 " MARINE ORGANISMS, DISTRIBUTION, ENVIRONMENTAL EFFECTS, INTERTIDAL ZONE, SCOTLAND
0996 " DRILLING, EXPLORATION, BIOLOGICAL EFFECTS, INVERTEBRATES, *DRILLING MUDS
0997 " DRILLING, BIOLOGICAL EFFECTS, INVERTEBRATES, *BARITE, *DRILLING MUDS
R073 " HYDROCARBONS , SEAWATER, SEDIMENT, CHEMICAL ANALYSIS, *TRANSPORT
0844 BERING SEA, HYDROCARBONS , FISH, UPTAKE, TOXICITY, METABOLISM, *NAPHTHALENE
0909 " BASELINE STUDIES, ALASKA , FISH, CARCINOGENS, HEALTH HAZARDS, OCS, *PATHOLOGY

0981 BERING SEA, ECOSYSTEMS, MODELS, MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS
0975 BERMUDA, TAR, WEATHERING, BIODEGRADATION, FATE, OIL SPILLS, TROPICAL REGIONS
R079 " HYDROCARBONS , FATE, DISTRIBUTION, SEDIMENTS, TAR, MODELS
0940 BIBLIOGRAPHIES, RISK ANALYSIS, CONTAMINATION, HARBORS, LITERATURE REVIEW
1012 " OIL SHALE, ENVIRONMENTAL EFFECTS, RESOURCE MANAGEMENT, WASTEWATERS, REGULATIONS, GROUNDWATER, COLORADO
1081 " WASTEWATER TREATMENT, REFINERIES, POLLUTION CONTROL, FLOTATION, FLOCCULATION, *COAGULATION
1091 " SOLID WASTES, WASTEWATERS, DISPOSAL, OIL SHALE
0722 BIOASSAY, ANALYTICAL TECHNIQUES, PAH, CHROMATOGRAPHY, TOXICITY
0864 " HYDROCARBONS , SUBLETHAL EFFECTS, FISH, CRUSTACEANS
0872 " ARCTIC, ALASKA , CRUDE OIL, BIOLOGICAL EFFECTS, ZOOPLANKTON, TOXICITY
0881 " FISH, SUBLETHAL EFFECTS, TOXICITY, WASTEWATERS, REFINERIES, BIOINDICATORS
R074 " FUEL OIL, WSF, CHEMICAL ANALYSIS, TOXICITY, UPTAKE, DEPURATION, FRESHWATER
R075 " BACTERIA, ANIMALS, MUTAGENS, FUEL OIL, TOXICITY, YEASTS
0718 BIODEGRADATION, CHEMICAL ANALYSIS, SPECTROSCOPY, CHROMATOGRAPHY, HYDROCARBONS , WEATHERING, *WATER SLUICES
0764 " DISPERSANTS, SPILL CLEANUP, SHIPS, PERFORMANCE TESTING, POLLUTION CONTROL, NEW YORK, *COREXIT 9527
0786 " SPILL CLEANUP, DISPERSANTS, TOXICITY
0792 " SPILL REMOVAL, WEATHERING, ENVIRONMENTAL EFFECTS, DISPERSANTS
0851 " ARCTIC, GASOLINE, BIOLOGICAL EFFECTS, SEDIMENTS, MICROORGANISMS, CHRONIC EFFECTS, LAKES
0868 " MICROORGANISMS, HEALTH HAZARDS, POLLUTION CONTROL
0880 " BACTERIA, ALASKA , CRUDE OIL, BIOLOGICAL EFFECTS, SOIL, FUNGI, YEASTS, TOXICITY, CHRONIC EFFECTS, SUBARCTIC REGIONS
0923 " EKOFISK BLOWOUT, BIOLOGICAL EFFECTS, FATE, DRIFT, HYDROCARBONS , DISTRIBUTION, NORTH SEA
0925 " ALASKA , CRUDE OIL, ENVIRONMENTAL EFFECTS, TOXICITY, *PROCEEDINGS
0948 " MICROORGANISMS, LAND FARMING, *FERTILIZATION
0949 " ARCTIC, CRUDE OIL, FERTILIZATION, FRESHWATER, *TUNDRA
0950 " BEHAVIOR, BACTERIA, HYDROCARBONS
0951 " SOIL, SLUDGE, CRUDE OIL
0952 " MICROORGANISMS, OIL SPILLS, MARINE ENVIRONMENT
0953 " CRUDE OIL, FUNGI, SOILS, CANADA, HYDROCARBONS , *N-ALKANES
0954 " BACTERIA, SPILL CLEANUP, PERFORMANCE TESTING
0955 " AROMATIC HYDROCARBONS, FATE, MICROORGANISMS, METABOLISM, *PSEUDOMONAS PXY, *BEIJERINCKIA
0956 " AROMATIC HYDROCARBONS, MICROORGANISMS
0957 " BACTERIA, ARCTIC, MICROORGANISMS, USSR, *MYOBACTERIUM SP.
0958 " BACTERIA, HYDROCARBONS , RIVERS, FRESHWATER, *ARTHROBACTER SP.
0959 " ALASKA , CRUDE OIL, BIOLOGICAL EFFECTS, SOIL, PLANTS
0960 " BALTIC SEA, BACTERIA, SAMPLING, HYDROCARBONS , FUEL OIL, MICROORGANISMS, FUNGI, SEDIMENTS
0961 " FUNGI, HYDROCARBONS , PETROLEUM PRODUCTS, CONCENTRATIONS, GROWTH, TAR, *FUSARIUM
0962 " MICROORGANISMS, PATENT
0963 " MICROORGANISMS, HYDROCARBONS , METABOLISM
0964 " BEACHES, HYDROCARBONS , REFINERIES, WASTEWATERS, CHRONIC EFFECTS, RECOVERY, FRANCE
0965 " BACTERIA, HYDROCARBONS , SEDIMENTS, COLD CLIMATES
0966 " GROUNDWATER, SOIL, MICROORGANISMS
0969 " LAND SPILLS, SOIL, TOXICITY, PLANTS
0975 " BERMUDA, TAR, WEATHERING, FATE, OIL SPILLS, TROPICAL REGIONS
0988 " AROMATIC HYDROCARBONS, CRUDE OIL, WSF, EVAPORATION, COLD CLIMATES, CHROMATOGRAPHY, WSF, CRUDE OIL
0990 " ENVIRONMENTAL EFFECTS, PETROLEUM PRODUCTS, TOXICITY, MICROORGANISMS, SEDIMENTS
R078 " MICROORGANISMS, DISTRIBUTION, OCEANS
0708 BIOGENIC HYDROCARBONS, HYDROCARBONS , CHEMICAL ANALYSIS, DETECTION, ENVIRONMENTAL EFFECTS, SEDIMENTS
0712 " BASELINE STUDIES, ALASKA , HYDROCARBONS , DISTRIBUTION, NATURAL SEEPS, MONITORING, OCS
0726 " SAMPLING, OIL DISCHARGES, CONCENTRATIONS, PLANKTON, OFFSHORE, GULF OF MEXICO, *BUCCANEER OILFIELD, *ALKANES
0728 " SAMPLING, OIL DISCHARGES, SEDIMENTS, OFFSHORE, GULF OF MEXICO, *BUCCANEER OILFIELD, *ALKANES
0746 " SOURCE IDENTIFICATION, HYDROCARBONS , DISTRIBUTION, CHEMICAL ANALYSIS, *ALKANES
0912 " BEAUFORT SEA, BASELINE STUDIES, ALASKA , HYDROCARBONS , DISTRIBUTION, SEDIMENTATION, OCS
0686 BIOINDICATORS, MONITORING, BIOLOGICAL EFFECTS, CONTAMINATION, TOXICITY, DETECTION
0693 " HYDROCARBONS , MONITORING, METABOLISM, FISH, *TAUTOGOLABRUS ADSPERSUS, *ARYL HYDROCARBON HYDROXYLASE
0859 " HYDROCARBONS , UPTAKE, METABOLISM, MARINE ORGANISMS, BIOLOGICAL EFFECTS, MOLLUSKS, *DETOXIFICATION MECHANISMS
0881 " BIOASSAY, FISH, SUBLETHAL EFFECTS, TOXICITY, WASTEWATERS, REFINERIES
0686 BIOLOGICAL EFFECTS, BIOINDICATORS, MONITORING, CONTAMINATION, TOXICITY, DETECTION

0804 BIOLOGICAL EFFECTS, SPILL CLEANUP, DISPERSANTS, PERFORMANCE TESTING, CONTINGENCY PLANNING, CHEMICAL EFFECTS, CALIFORNIA
0835 " OIL SPILLS, OIL TRANSFER, BIRDS, MORTALITY, UK, *WALES, *PODICEPS CRISTATUS
0837 " CRUDE OIL, PLANTS, CHRONIC EFFECTS, *SALIX ROTUNDIFOLIA
0839 " HYDROCARBONS , PHYTOPLANKTON, MARINE ENVIRONMENT, BIOMASS, *GUFEX
0840 " CONTAMINATION, ZOOPLANKTON, MICROORGANISMS, FRESHWATER
0841 " TROPICAL REGIONS, INTERTIDAL ZONE
0842 " FUEL OIL, BIRDS, MORTALITY, CHONIC EFFECTS, REPRODUCTION, *LARUS MARINUS
0843 " BEHAVIOR, MARINE ORGANISMS, TOXICITY
0846 " WSF, TOXICITY, MORTALITY, CRUSTACEANS
0851 " BIODEGRADATION, ARCTIC, GASOLINE, SEDIMENTS, MICROORGANISMS, CHRONIC EFFECTS, LAKES
0852 " BACTERIA, ARCTIC, CRUDE OIL, MICROORGANISMS, SEDIMENTS, TOXICITY, LAKES
0854 " AROMATIC HYDROCARBONS, CRUDE OIL, TOXICITY, MORTALITY, FISH, *ONCORHYNCHUS GORBUSCHA, *EUALUS SPP., *PANDALUS GONIURUS
0858 " HYDROCARBONS , MARINE ORGANISMS, UPTAKE, DEPURATION, MOLLUSKS, *BIVALVES
0859 " BIOINDICATORS, HYDROCARBONS , UPTAKE, METABOLISM, MARINE ORGANISMS, MOLLUSKS, *DETOXIFICATION MECHANISMS
0860 " OIL SPILLS, SPILL RESPONSE, CONTINGENCY PLANNING, ENVIRONMENTAL EFFECTS
0861 " CRUDE OIL, PLANTS, SOIL, *SALIX ROTUNDIFOLIA
0866 " ARCTIC, CRUDE OIL, PHYTOPLANKTON, LAKES , FRESHWATER
0867 " ALASKA , CRUDE OIL, FUNGI, *TUNDRA
0869 " ALASKA , CRUDE OIL, TOXICITY, *AQUATIC INSECTS, *TUNDRA
0870 " ALGAE, CRUDE OIL, WSF, MARINE ENVIRONMENT, *DUNALLIELA TERTIOLECTA
0871 " HYDROCARBONS , UPTAKE, DEPURATION, MOLLUSKS, *TAPES SEMIDECUSSATA
0872 " BIOASSAY, ARCTIC, ALASKA , CRUDE OIL, ZOOPLANKTON, TOXICITY
0874 " PETROLEUM PRODUCTS, CRUDE OIL, SOURCES, TOXICITY, FISH, SHELLFISH, DELAWARE BAY, *URBAN RUNOFF
0879 " ALASKA , CRUDE OIL, OIL SPILLS, MICROORGANISMS, *TUNDRA
0880 " BIODEGRADATION, BACTERIA, ALASKA , CRUDE OIL, SOIL, FUNGI, YEASTS, TOXICITY, CHRONIC EFFECTS, SUBARCTIC REGIONS
0885 " WSF, TOXICITY, MORTALITY, SUBLETHAL EFFECTS, REPRODUCTION, *COPEPOD, *NITOCRA AFFINIS
0888 " ALASKA , CRUDE OIL, PLANTS, TOXICITY, RECOVERY, CONTINGENCY PLANNING, *DIESEL OIL
0889 " FUEL OIL, BIRDS, MORTALITY, TOXICITY, REPRODUCTION
0890 " HYDROCARBONS , CHEMICAL EFFECTS, MICROORGANISMS, *CHLOROPHYLL
0919 " RESOURCE MANAGEMENT, GOVERNMENT AGENCIES, CANADA, BIRDS, CONTAMINATION
0921 " BALTIC SEA, OIL SPILLS, WASTEWATERS, CHEMICAL EFFECTS, FATE
0923 " BIODEGRADATION, EKOFISK BLOWOUT, FATE, DRIFT, HYDROCARBONS , DISTRIBUTION, NORTH SEA
0924 " FUEL OIL, CHRONIC EFFECTS, RECOVERY, TOXICITY, MARSHES, SEDIMENTS, MASSACHUSETTS, *FUNDULUS
0929 " ANALYTICAL TECHNIQUES, SOURCES, FATE, FRESHWATER, MARINE ENVIRONMENT, *PROCEEDINGS
0930 " ALASKA , CRUDE OIL, PHYSICAL EFFECTS, CHEMICAL EFFECTS, SOIL, CHRONIC EFFECTS, PLANTS, MORTALITY, RECOVERY, *BLACK SPRUCE, *TUNDRA
0935 " BACTERIA, ARCTIC, FATE, CRUDE OIL, SOIL, PHYSICAL EFFECTS, CHEMICAL EFFECTS, FUNGI, PLANTS, CHRONIC EFFECTS, *TUNDRA
0937 " OIL SPILLS, INTERTIDAL ZONE, PHYSICAL EFFECTS, CHEMICAL EFFECTS, *EXPERIMENTAL DESIGN
0946 " EKOFISK BLOWOUT, FATE, INTERNATIONAL AGREEMENTS, NORTH SEA
0959 " BIODEGRADATION, ALASKA , CRUDE OIL, SOIL, PLANTS
0996 " BENTHOS, DRILLING, EXPLORATION, INVERTEBRATES, *DRILLING MUDS
0997 " BENTHOS, DRILLING, INVERTEBRATES, *BARITE, *DRILLING MUDS
1009 " OFFSHORE, PRODUCTION, DRILLING, PHYSICAL EFFECTS, CHEMICAL EFFECTS, LOUISIANA, *OFFSHORE ECOLOGY INVESTIGATION
1039 " SPILL RESPONSE, POLLUTION CONTROL, WILDLIFE, FISHERIES, DISPERSANTS, UK, *CHRISTOS BITAS SPILL
1062 " OIL TERMINALS, TANKERS, OIL-WATER SEPARATION, SURVEILLANCE, OIL SPILLS, FUEL OIL, SCOTLAND, *SULLOM VOE TERMINAL
R076 " HYDROCARBONS , FISH, CRUSTACEANS, MOLLUSKS, TOXICITY
0790 BIOLOGICAL TREATMENT, OIL REMOVAL, SEDIMENTS, POLLUTION CONTROL, OXIDATION, PATENT
0839 BIOMASS, BIOLOGICAL EFFECTS, HYDROCARBONS , PHYTOPLANKTON, MARINE ENVIRONMENT, *GUFEX
0801 BIRDS, ANIMALS, OIL SPILLS, SPILL CLEANUP, ENVIRONMENTAL EFFECTS, MORTALITY, SCOTLAND, *ESSO BERNICIA SPILL
0835 " BIOLOGICAL EFFECTS, OIL SPILLS, OIL TRANSFER, MORTALITY, UK, *WALES, *PODICEPS CRISTATUS
0842 " BIOLOGICAL EFFECTS, FUEL OIL, MORTALITY, CHONIC EFFECTS, REPRODUCTION, *LARUS MARINUS
0845 " ANALYTICAL TECHNIQUES, ACUTE EFFECTS, HYDROCARBONS , CHRONIC EFFECTS, TOXICITY, MORTALITY, WILDLIFE
0850 " CRUDE OIL, CHRONIC EFFECTS, REPRODUCTION, GROWTH
0875 " ALASKA , CRUDE OIL, PETROLEUM PRODUCTS, TOXICITY, MORTALITY, *HATCHING, *LARUS GLAUCESCENS
0882 " TOXICITY, SUBLETHAL EFFECTS, GROWTH, MORTALITY, *ANAS PLATYRHYNCHOS
0889 " BIOLOGICAL EFFECTS, FUEL OIL, MORTALITY, TOXICITY, REPRODUCTION

0919 BIRDS, BIOLOGICAL EFFECTS, RESOURCE MANAGEMENT, GOVERNMENT AGENCIES, CANADA, CONTAMINATION
1060 " OIL TERMINALS, TANKERS, OIL SPILLS, FUEL OIL, MORTALITY, ENVIRONMENTAL EFFECTS, COASTS, WILDLIFE, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1008 BLM, OCS, DRILLING, PRODUCTION, PLATFORMS, CHRONIC EFFECTS, LOUISIANA, GULF OF MEXICO
0807 BLOWOUT PREVENTION, PERSONNEL TRAINING
0827 " OFFSHORE, DRILLING, POLLUTION PREVENTION, EQUIPMENT, MEDITERRANEAN SEA, NORTH SEA
0829 " OIL WELLS, DRILLING, OFFSHORE, POLLUTION PREVENTION, SAFETY, EQUIPMENT, DESIGN-ENGINEERING
0831 " DESIGN-ENGINEERING, EQUIPMENT, DRILLING
0833 BLOWOUTS, OIL WELLS, DRILLING, POLLUTION CONTROL
0896 " EIS, OFFSHORE, DRILLING, ICE, COLD CLIMATES, CANADA, *LANCASTER SOUND
1028 " POLLUTION CONTROL, SPILL RESPONSE, SPILL CONTAINMENT, MEXICO, *IXTOC 1 BLOWOUT
0755 BOOMS, SPILL CONTAINMENT, DESIGN-ENGINEERING, EQUIPMENT, PERFORMANCE TESTIING, *PNEUMATIC BARRIER
0756 " SPILL CONTAINMENT, DESIGN-ENGINEERING, PATENT
0757 " SPILL CONTAINMENT, EQUIPMENT, DESIGN-ENGINEERING, PATENT
0758 " SPILL CONTAINMENT, EQUIPMENT, DESIGN-ENGINEERING, OIL-WATER SEPARATION, PATENT
0759 " SPILL CONTAINMENT, DESIGN-ENGINEERING, PATENT
0760 " SPILL CONTAINMENT, DESIGN-ENGINEERING, PATENT
0772 " SPILL CLEANUP, SHIPS, EQUIPMENT, DISIGN-ENGINEERING, PATENT
0793 " SPILL CLEANUP, SKIMMERS, EQUIPMENT, PERFORMANCE TESTING, DESIGN-ENGINEERING, *OHMSETT
0794 " SPILL CLEANUP, SKIMMERS, EQUIPMENT, DESIGN-ENGINEERING, PERFORMANCE TESTING, *OHMSETT
0779 BOUCHARD 65 SPILL, SPILL CLEANUP, ICE, SPILL REMOVAL, SPREADING, WEATHERING, BUZZARDS BAY
0783 BURNING, SPILL REMOVAL, CRUDE OIL, OIL SLICKS, PERFORMANCE TESTING, EQUIPMENT, *INCENDIARY DEVICES
0795 " ALASKA , CRUDE OIL, ENVIRONMENTAL EFFECTS, PLANTS, SOIL, RECOVERY, GROWTH
0779 BUZZARDS BAY, BOUCHARD 65 SPILL, SPILL CLEANUP, ICE, SPILL REMOVAL, SPREADING, WEATHERING
0804 CALIFORNIA, BIOLOGICAL EFFECTS, SPILL CLEANUP, DISPERSANTS, PERFORMANCE TESTING, CONTINGENCY PLANNING, CHEMICAL EFFECTS
1013 " OCS, OIL-GAS LEASING, ENVIRONMENTAL EFFECTS, OFFSHORE, DEVELOPMENT, SANTA BARBARA CHANNEL
0701 CANADA, BEHAVIOR, REMOTE SENSING, OIL SPILLS, PHYSICAL ASPECTS, SEA SURFACE, PERFORMANCE TESTING
0751 " ARCTIC, SOURCE IDENTIFICATION, CHEMICAL ANALYSIS, NATURAL SEEPAGE, OIL SLICKS
0815 " CONTINGENCY PLANNING, SPILL COOPERATIVES, GOVERNMENT AGENCIES, OIL INDUSTRY
0819 " INTERNATIONAL AGREEMENTS, POLLUTION PREVENTION, OFFSHORE, SPILL CLEANUP, GREENLAND, DENMARK
0838 " BENTHOS, OIL SPILLS, TAR SANDS, SLUDGE , FRESHWATER, MORTALITY, TOXICITY, INVERTEBRATES, RIVERS
0847 " BEHAVIOR, OIL SPILLS, ENVIRONMENTAL EFFECTS, MARINE MAMMALS, MORTALITY, *BRITISH COLUMBIA, *ENHYDRA LUTRIS
0894 " OIL SPILLS, ENVIRONMENTAL EFFECTS, ICE, COLD CLIMATES
0896 " BLOWOUTS, EIS, OFFSHORE, DRILLING, ICE, COLD CLIMATES, *LANCASTER SOUND
0919 " BIRDS, BIOLOGICAL EFFECTS, RESOURCE MANAGEMENT, GOVERNMENT AGENCIES, CONTAMINATION
0943 " FRESHWATER, ENVIRONMENTAL EFFECTS
0953 " BIODEGRADATION, CRUDE OIL, FUNGI, SOILS, HYDROCARBONS , *N-ALKANES
0984 " MODELS, STATISTICS, OIL SPILLS, PREDICTIONS, INFORMATION SYSTEMS
1010 " ARCTIC, DEVELOPMENT, DRILLING, ENVIRONMENTAL EFFECTS, WILDLIFE, LIABILITY, RISK ANALYSIS, *LANCASTER SOUND
1033 " OIL SPILLS, TANKERS, FUEL OIL, ICE, COLD CLIMATES, *KURDISTAN SPILL, *NOVA SCOTIA
0732 CARCINOGENS, PAH, CHEMICAL ANALYSIS, HEALTH HAZARDS, MUTAGENS, METABOLISM
0834 " HEALTH HAZARDS, GUIDELINES, MARINE ENVIRONMENT
0909 " BERING SEA, BASELINE STUDIES, ALASKA , FISH, HEALTH HAZARDS, OCS, *PATHOLOGY
0973 " PAH, FATE, *VOLITILIZATION
0705 CHEMICAL ANALYSIS, CHROMATOGRAPHY, SPECTROMETRY, HYDROCARBONS , SOURCES
0708 " BIOGENIC HYDROCARBONS, HYDROCARBONS , DETECTION, ENVIRONMENTAL EFFECTS, SEDIMENTS
0710 " PETROLEUM PRODUCTS, PETROCHEMICALS, DETECTION, *FLUORESCENCE
0714 " PHYSICAL ASPECTS, PETROLEUM PRODUCTS, TOXICITY, EVAPORATION
0718 " BIODEGRADATION, SPECTROSCOPY, CHROMATOGRAPHY, HYDROCARBONS , WEATHERING, *WATER SLUICES
0719 " CHROMATOGRAPHY, TAR, HYDROCARBONS , SOURCE IDENTIFICATION
0720 " CHROMATOGRAPHY, HYDROCARBONS , SOIL
0729 " DETECTION, SPECTROMETRY, PETROLEUM PRODUCTS, *FLUORESCENCE SPECTROPHOTOMETRY
0731 " PETROLEUM PRODUCTS, CHROMATOGRAPHY, *GRAVIMETRIC ANALYSIS
0732 " CARCINOGENS, PAH, HEALTH HAZARDS, MUTAGENS, METABOLISM
0733 " CONTAMINATION, HYDROCARBONS , SEAWATER, PHYTOPLANKTON, CHROMATOGRAPHY, USSR
0740 " AROMATIC HYDROCARBONS, HYDROCARBONS , PETROLEUM PRODUCTS, SAMPLING, SOLUBILITY, *PARTITION COEFFICIENTS
0741 " CONCENTRATIONS, SEDIMENTS, FRESHWATER, SEAWATER

0742 CHEMICAL ANALYSIS, CHROMATOGRAPHY, SPECTROMETRY, PAH, NATURAL SEEPAGE, SEDIMENTS, SEAWATER, *HEADSPACE SAMPLING
0745 " SOURCE IDENTIFICATION, WEATHERING, LAW ENFORCEMENT, EPA
0746 " BIOGENIC HYDROCARBONS, SOURCE IDENTIFICATION, HYDROCARBONS , DISTRIBUTION, *ALKANES
0751 " CANADA, ARCTIC, SOURCE IDENTIFICATION, NATURAL SEEPAGE, OIL SLICKS
0752 " SOURCE IDENTIFICATION, LIABILITY, LAW ENFORCEMENT
0753 " SOURCE IDENTIFICATION, SPECTROSCOPY, NATURAL SEEPAGE, WEATHERING, SANTA BARBARA CHANNEL, *IR
0832 " OIL SHALE, CONTAMINATION, MONITORING, POLLUTION CONTROL, EPA, SAMPLING
0863 " AROMATIC HYDROCARBONS, FISH, METABOLISM, CHROMATOGRAPHY
1107 " WASTE OIL, CRANKCASE OIL, LUBRICATING OIL, HYDROCARBONS , CHROMATOGRAPHY, RECLAMATION, US
R073 " BENTHOS, HYDROCARBONS , SEAWATER, SEDIMENT, *TRANSPORT
R074 " BIOASSAY, FUEL OIL, WSF, TOXICITY, UPTAKE, DEPURATION, FRESHWATER
R080 " HYDROCARBONS , SEAWATER, FATE, SOLUBILITY
0804 CHEMICAL EFFECTS, CALIFORNIA, BIOLOGICAL EFFECTS, SPILL CLEANUP, DISPERSANTS, PERFORMANCE TESTING, CONTINGENCY PLANNING
0890 " BIOLOGICAL EFFECTS, HYDROCARBONS , MICROORGANISMS, *CHLOROPHYLL
0921 " BIOLOGICAL EFFECTS, BALTIC SEA, OIL SPILLS, WASTEWATERS, FATE
0926 " ALASKA , CRUDE OIL, ENVIRONMENTAL EFFECTS, PHYSICAL EFFECTS, SOIL, SUBARCTIC REGIONS, *TUNDRA
0930 " BIOLOGICAL EFFECTS, ALASKA , CRUDE OIL, PHYSICAL EFFECTS, SOIL, CHRONIC EFFECTS, PLANTS, MORTALITY, RECOVERY, *BLACK SPRUCE, *TUNDRA
0935 " BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, FATE, CRUDE OIL, SOIL, PHYSICAL EFFECTS, FUNGI, PLANTS, CHRONIC EFFECTS, *TUNDRA
0937 " BIOLOGICAL EFFECTS, OIL SPILLS, INTERTIDAL ZONE, PHYSICAL EFFECTS, *EXPERIMENTAL DESIGN
1009 " BIOLOGICAL EFFECTS, OFFSHORE, PRODUCTION, DRILLING, PHYSICAL EFFECTS, LOUISIANA, *OFFSHORE ECOLOGY INVESTIGATION
0689 CHROMATOGRAPHY, DETECTION, PETROLEUM PRODUCTS, WASTEWATERS, *HEAD-SPACE METHOD
0705 " CHEMICAL ANALYSIS, SPECTROMETRY, HYDROCARBONS , SOURCES
0706 " ANALYTICAL TECHNIQUES, PAH, DETECTION
0707 " ANALYTICAL TECHNIQUES, PAH, DETECTION, SAMPLING, SEDIMENTS, FRESHWATER
0711 " ANALYTICAL TECHNIQUES, HYDROCARBONS , NOAA
0716 " ANALYTICAL TECHNIQUES, GC/MS, DETECTION, HYDROCARBONS , FRESHWATER, *FLAME IONIZATION, *FLAME PHOTOMETRY
0718 " CHEMICAL ANALYSIS, BIODEGRADATION, SPECTROSCOPY, HYDROCARBONS , WEATHERING, *WATER SLUICES
0719 " CHEMICAL ANALYSIS, TAR, HYDROCARBONS , SOURCE IDENTIFICATION
0720 " CHEMICAL ANALYSIS, HYDROCARBONS , SOIL
0722 " BIOASSAY, ANALYTICAL TECHNIQUES, PAH, TOXICITY
0723 " ANALYTICAL TECHNIQUES, PAH, DETECTION, LAKES , *AIR-WATER INTERFACE, LOUISIANA
0730 " AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES, DETECTION
0731 " CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, *GRAVIMETRIC ANALYSIS
0733 " CHEMICAL ANALYSIS, CONTAMINATION, HYDROCARBONS , SEAWATER, PHYTOPLANKTON, USSR
0742 " CHEMICAL ANALYSIS, SPECTROMETRY, PAH, NATURAL SEEPAGE, SEDIMENTS, SEAWATER, *HEADSPACE SAMPLING
0743 " ANIMALS, ANALYTICAL TECHNIQUES, HYDROCARBONS , DETECTION, PETROLEUM PRODUCTS, *RUMINANTS
0744 " AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES
0863 " CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, FISH, METABOLISM
0908 " BASELINE STUDIES, HYDROCARBONS , OIL TRANSPORT, PORTS , PUGET SOUND
0988 " BIODEGRADATION, AROMATIC HYDROCARBONS, CRUDE OIL, WSF, EVAPORATION, COLD CLIMATES, WSF, CRUDE OIL
1107 " CHEMICAL ANALYSIS, WASTE OIL, CRANKCASE OIL, LUBRICATING OIL, HYDROCARBONS , RECLAMATION, US
0837 CHRONIC EFFECTS, BIOLOGICAL EFFECTS, CRUDE OIL, PLANTS, *SALIX ROTUNDIFOLIA
0845 " BIRDS, ANALYTICAL TECHNIQUES, ACUTE EFFECTS, HYDROCARBONS , TOXICITY, MORTALITY, WILDLIFE
0848 " HYDROCARBONS , COASTS, ECOSYSTEMS, *WETLANDS
0850 " BIRDS, CRUDE OIL, REPRODUCTION, GROWTH
0851 " BIOLOGICAL EFFECTS, BIODEGRADATION, ARCTIC, GASOLINE, SEDIMENTS, MICROORGANISMS, LAKES
0860 " BIOLOGICAL EFFECTS, BIODEGRADATION, BACTERIA, ALASKA , CRUDE OIL, SOIL, FUNGI, YEASTS, TOXICITY, SUBARCTIC REGIONS
0895 " ALASKA , CRUDE OIL, VEGETATION, SOIL, TOXICITY, RECOVERY, *TUNDRA
0924 " BIOLOGICAL EFFECTS, FUEL OIL, RECOVERY, TOXICITY, MARSHES, SEDIMENTS, MASSACHUSETTS, *FUNDULUS
0930 " CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, ALASKA , CRUDE OIL, PHYSICAL EFFECTS, SOIL, PLANTS, MORTALITY, RECOVERY, *BLACK SPRUCE, *TUNDRA
0934 " BACTERIA, ARCTIC, FATE, CRUDE OIL, SOIL, FUNGI, PLANTS, ENVIRONMENTAL EFFECTS, *TUNDRA
0935 " CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, FATE, CRUDE OIL, SOIL, PHYSICAL EFFECTS, FUNGI, PLANTS, *TUNDRA
0936 " AFRICA, OIL SPILLS, ENVIRONMENTAL EFFECTS, RECOVERY, TANKERS, *VENPET-VENOIL SPILL

0964 CHRONIC EFFECTS, BIODEGRADATION, BEACHES, HYDROCARBONS , REFINERIES, WASTEWATERS, RECOVERY, FRANCE
1008 " BLM, OCS, DRILLING, PRODUCTION, PLATFORMS, LOUISIANA, GULF OF MEXICO
1076 COALESCENCE, CRUDE OIL
0699 COASTAL WATERS, REMOTE SENSING, SURVEILLANCE, POLLUTION CONTROL, FRANCE
0704 " REMOTE SENSING, SURVEILLANCE, USCG, POLLUTION CONTROL
0736 " SAMPLING, CONCENTRATIONS, HYDROCARBONS , OFFSHORE, INDIA
0941 " CONTAMINATION, SHIPS, TANKERS, OIL DISCHARGES, JAPAN, COASTAL ZONE MANAGEMENT
1067 " LEGISLATION, SPILL CLEANUP, COMPENSATION, LIABILITY
0813 COASTAL ZONE MANAGEMENT, OFFSHORE, DEVELOPMENT, GEORGES BANK, MASSACHUSETTS
0927 " DEVELOPMENT, ENVIRONMENTAL EFFECTS, OFFSHORE, OCS, OIL-GAS LEASING
0941 " COASTAL WATERS, CONTAMINATION, SHIPS, TANKERS, OIL DISCHARGES, JAPAN
1000 " ONSHORE IMPACTS, OIL-GAS LEASING, OCS, SOCIOECONOMIC EFFECTS
1005 " OIL-GAS LEASING, LEGISLATION, REGULATIONS, RESOURCE MANAGEMENT, OCS, DEVELOPMENT, *PUBLIC PARTICIPATION
1018 " ENVIRONMENTAL EFFECTS, FATE, SOURCES, FISHERIES
1066 " OIL TRANSPORT, REGULATIONS
0848 COASTS, CHRONIC EFFECTS, HYDROCARBONS , ECOSYSTEMS, *WETLANDS
1060 " BIRDS, OIL TERMINALS, TANKERS, OIL SPILLS, FUEL OIL, MORTALITY, ENVIRONMENTAL EFFECTS, WILDLIFE, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
0683 COLD CLIMATES, OIL SPILLS, ICE, DETECTION
0770 " ALASKA , SPILL REMOVAL, SPILL CLEANUP, SORBENTS, ICE, OIL TANKS
0894 " CANADA, OIL SPILLS, ENVIRONMENTAL EFFECTS, ICE
0896 " CANADA, BLOWOUTS, EIS, OFFSHORE, DRILLING, ICE, *LANCASTER SOUND
0965 " BIODEGRADATION, BACTERIA, HYDROCARBONS , SEDIMENTS
0988 " CHROMATOGRAPHY, BIODEGRADATION, AROMATIC HYDROCARBONS, CRUDE OIL, WSF, EVAPORATION, WSF, CRUDE OIL
1033 " CANADA, OIL SPILLS, TANKERS, FUEL OIL, ICE, *KURDISTAN SPILL, *NOVA SCOTIA
R077 " BASELINE STUDIES, ARCTIC, HYDROCARBONS , CONTAMINATION
0830 COMPENSATION, SOURCES, POLLUTION PREVENTION, REGULATIONS, INTERNATIONAL AGREEMENTS, JAPAN
1002 " LEGISLATION, REGULATIONS, OIL INDUSTRY, SOLID WASTES, NORWAY
1067 " COASTAL WATERS, LEGISLATION, SPILL CLEANUP, LIABILITY
0725 CONCENTRATIONS, ANALYTICAL TECHNIQUES, SAMPLING, FISH, HYDROCARBONS , OFFSHORE, GULF OF MEXICO, *BUCCANEER OILFIELD, *ALKANES
0726 " BIOGENIC HYDROCARBONS, SAMPLING, OIL DISCHARGES, PLANKTON, OFFSHORE, GULF OF MEXICO, *BUCCANEER OILFIELD, *ALKANES
0727 " SAMPLING, OIL DISCHARGES, HYDROCARBONS , OFFSHORE, PLATFORMS, GULF OF MEXICO, *BUCCANEER OILFIELD, *ALKANES
0736 " COASTAL WATERS, SAMPLING, HYDROCARBONS , OFFSHORE, INDIA
0741 " CHEMICAL ANALYSIS, SEDIMENTS, FRESHWATER, SEAWATER
0887 " DISPERSANTS, TOXICITY, MARINE ORGANISMS, MORTALITY, MOLLUSKS
0892 " SEDIMENTS, WATER QUALITY, PETROLEUM PRODUCTS, *DREDGING
0961 " BIODEGRADATION, FUNGI, HYDROCARBONS , PETROLEUM PRODUCTS, GROWTH, TAR, *FUSARIUM
0968 " BEHAVIOR, OIL SLICKS, EVAPORATION, HYDROCARBONS
0974 " HYDROCARBONS , MARINE ENVIRONMENT, PHYSICAL EFFECTS, SEA SURFACE, SAMPLING, SOURCES, *ATMOSPHERIC INPUTS
0993 " BAYS, HYDROCARBONS , SAMPLING, CHEMICAL ANALYSIS, RIVERS, SEDIMENTS, NARRAGANSETT BAY
0825 CONSERVATION, CORAL REEFS, OIL-GAS LEASING, DEVELOPMENT, OFFSHORE, DRILLING, SEDIMENTATION, NOAA, GULF OF MEXICO, *MARINE SANCTUARY
0681 CONTAMINATION, OIL SLICKS, DETECTION, EQUIPMENT, DESIGN-ENGINEERING, PATENT
0686 " BIOLOGICAL EFFECTS, BIOINDICATORS, MONITORING, TOXICITY, DETECTION
0690 " ANALYTICAL TECHNIQUES, MONITORING, UPTAKE, TOXICITY, FISH, *BIOPSY
0733 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS , SEAWATER, PHYTOPLANKTON, USSR
0735 " ANALYTICAL TECHNIQUES, WASTEWATERS, MONITORING, REFINING, *ENZYME INHIBITION SCREENING
0789 " SPILL CLEANUP, LAND SPILLS, WASTE OIL TREATMENT, PATENT
0832 " CHEMICAL ANALYSIS, OIL SHALE, MONITORING, POLLUTION CONTROL, EPA, SAMPLING
0840 " BIOLOGICAL EFFECTS, ZOOPLANKTON, MICROORGANISMS, FRESHWATER
0878 " AROMATIC HYDROCARBONS, FISH, CRUDE OIL, WSF, TOXICITY, *BIOACCUMULATION
0883 " ANIMALS, PLANTS, PETROCHEMICALS
0919 " CANADA, BIRDS, BIOLOGICAL EFFECTS, RESOURCE MANAGEMENT, GOVERNMENT AGENCIES
0940 " BIBLIOGRAPHIES, RISK ANALYSIS, HARBORS, LITERATURE REVIEW
0941 " COASTAL ZONE MANAGEMENT, COASTAL WATERS, SHIPS, TANKERS, OIL DISCHARGES, JAPAN
0942 " FATE, ENVIRONMENTAL EFFECTS, WASTEWATERS, NEW YORK, *NEW YORK BIGHT
0978 " MODELS, GROUNDWATER, MOVEMENT
1073 " GROUNDWATER, POLLUTION CONTROL, SOURCES, PETROLEUM PRODUCTS, STORAGE, PIPELINES, REGULATIONS
R077 " COLD CLIMATES, BASELINE STUDIES, ARCTIC, HYDROCARBONS
0688 CONTINGENCY PLANNING, MONITORING, OIL SPILLS, INTERNATIONAL AGREEMENTS, RESOURCE MANAGEMENT, *IGOSS
0804 " CHEMICAL EFFECTS, CALIFORNIA, BIOLOGICAL EFFECTS, SPILL CLEANUP, DISPERSANTS, PERFORMANCE TESTING
0808 " PERSONNEL TRAINING, SPILL RESPONSE, SPILL CLEANUP, REGULATION, *VIDEO TAPES

0811 CONTINGENCY PLANNING, OIL INDUSTRY, SPILL COOPERATIVES, SPILL RESPONSE
0814 " BEACH CLEANUP, SPILL RESPONSE, DISPERSANTS, FUEL OIL, POLLUTION PREVENTION, TANKERS
0815 " CANADA, SPILL COOPERATIVES, GOVERNMENT AGENCIES, OIL INDUSTRY
0816 " INTERNATIONAL CONVENTIONS, GOVERNMENT AGENCIES, OIL INDUSTRY, IMCO, *UNEP
0817 " SPILL RESPONSE, EPA, OIL INDUSTRY, GUIDELINES, *INLAND SPILLS
0826 " POLLUTION CONTROL, DISPERSANTS, SPILL CLEANUP, SPILL RESPONSE, EQUIPMENT, UK
0860 " BIOLOGICAL EFFECTS, OIL SPILLS, SPILL RESPONSE, ENVIRONMENTAL EFFECTS
0888 " BIOLOGICAL EFFECTS, ALASKA , CRUDE OIL, PLANTS, TOXICITY, RECOVERY, *DIESEL OIL
0931 " BEHAVIOR, OIL TRANSPORT, EQUIPMENT, LEGISLATION, SPILL RESPONSE, POLLUTION PREVENTION, POLLUTION CONTROL, DISPERSANTS, *CONFERENCE
1057 " SPILL RESPONSE, SPILL CLEANUP, OIL TERMINALS, TANKERS, SCOTLAND, *ESSO BERNICIA SPILL, *SULLOM VOE TERMINAL
0825 CORAL REEFS, CONSERVATION, OIL-GAS LEASING, DEVELOPMENT, OFFSHORE, DRILLING, SEDIMENTATION, NOAA, GULF OF MEXICO, *MARINE SANCTUARY
0893 COST ANALYSIS, SOCIOECONOMIC EFFECTS, ECONOMICS, ONSHORE IMPACTS, OIL SPILLS, SANTA BARBARA CHANNEL
0947 " SOURCES, ENVIRONMENTAL EFFECTS, POLLUTION CONTROL, FATE, MODELS, LEGISLATION, RESOURCE MANAGEMENT
1069 " GASOLINE, OIL TRANSFER, POLLUTION PREVENTION, ECONOMICS, REGULATIONS, GUIDELINES
1086 " REFINERIES, WASTEWATERS, PETROLEUM PRODUCTS, OIL-WATER SEPARATION, POLLUTION PREVENTION, GUIDELINES
1113 " POLLUTION CONTROL, ECONOMIC EFFECTS, REFINERIES, OIL INDUSTRY
0971 CRANKCASE OIL, PAH, SEDIMENTS, FATE, *STORMWATER RUNOFF
1107 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, WASTE OIL, LUBRICATING OIL, HYDROCARBONS , RECLAMATION, US
1108 " WASTE OIL, DISPOSAL, ENVIRONMENTAL EFFECTS, HEALTH HAZARDS, RECLAMATION, RECYCLING, US, LEGISLATION, STATE GOVERNMENTS, EUROPE
0684 CRUDE OIL, DETECTION, OIL SLICKS, SEA SURFACE, PHYSICAL ASPECTS, *CAPACITANCE, *LASER REFLECTANCE
0715 " ANALYTICAL TECHNIQUES, MUTAGENS, PAH, MICROORGANISMS, *SALMONELLA TYPHIMURIUM/MICROSOMAL ACTIVATION
0721 " ANALYTICAL TECHNIQUES, GC/MS
0783 " BURNING, SPILL REMOVAL, OIL SLICKS, PERFORMANCE TESTING, EQUIPMENT, *INCENDIARY DEVICES
0795 " BURNING, ALASKA , ENVIRONMENTAL EFFECTS, PLANTS, SOIL, RECOVERY, GROWTH
0837 " CHRONIC EFFECTS, BIOLOGICAL EFFECTS, PLANTS, *SALIX ROTUNDIFOLIA
0849 " MARSHES, FUEL OIL, SUBLETHAL EFFECTS, MODELS, SAMPLING
0850 " CHRONIC EFFECTS, BIRDS, REPRODUCTION, GROWTH
0852 " BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, MICROORGANISMS, SEDIMENTS, TOXICITY, LAKES
0853 " ACUTE EFFECTS, HYDROCARBONS , WSF, FISH, CRUSTACEANS, MORTALITY, TOXICITY, *TEMPERATURE EFFECTS
0854 " BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, TOXICITY, MORTALITY, FISH, *ONCORHYNCHUS GORBUSCHA, *EUALUS SPP., *PANDALUS GONIURUS
0861 " BIOLOGICAL EFFECTS, PLANTS, SOIL, *SALIX ROTUNDIFOLIA
0865 " AROMATIC HYDROCARBONS, ALASKA , SUBLETHAL EFFECTS, RESPIRATION, *HEART RATE, *NAPHTHALENE, *BENZENE, *PARALITHODES CAMTSCHATICA
0866 " BIOLOGICAL EFFECTS, ARCTIC, PHYTOPLANKTON, LAKES , FRESHWATER
0867 " BIOLOGICAL EFFECTS, ALASKA , FUNGI, *TUNDRA
0869 " BIOLOGICAL EFFECTS, ALASKA , TOXICITY, *AQUATIC INSECTS, *TUNDRA
0870 " BIOLOGICAL EFFECTS, ALGAE, WSF, MARINE ENVIRONMENT, *DUNALLIELA TERTIOLECTA
0872 " BIOLOGICAL EFFECTS, BIOASSAY, ARCTIC, ALASKA , ZOOPLANKTON, TOXICITY
0873 " AROMATIC HYDROCARBONS, UPTAKE, DEPURATION, FISH, *ANGUILLA JAPONICA, *SULFUR
0874 " BIOLOGICAL EFFECTS, PETROLEUM PRODUCTS, SOURCES, TOXICITY, FISH, SHELLFISH, DELAWARE BAY, *URBAN RUNOFF
0875 " BIRDS, ALASKA , PETROLEUM PRODUCTS, TOXICITY, MORTALITY, *HATCHING, *LARUS GLAUCESCENS
0878 " CONTAMINATION, AROMATIC HYDROCARBONS, FISH, WSF, TOXICITY, *BIOACCUMULATION
0879 " BIOLOGICAL EFFECTS, ALASKA , OIL SPILLS, MICROORGANISMS, *TUNDRA
0880 " CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, BACTERIA, ALASKA , SOIL, FUNGI, YEASTS, TOXICITY, SUBARCTIC REGIONS
0888 " CONTINGENCY PLANNING, BIOLOGICAL EFFECTS, ALASKA , PLANTS, TOXICITY, RECOVERY, *DIESEL OIL
0895 " CHRONIC EFFECTS, ALASKA , VEGETATION, SOIL, TOXICITY, RECOVERY, *TUNDRA
0899 " EIS, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, TEXAS
0900 " EIS, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, TEXAS
0901 " EIS, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS
0902 " EIS, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, LOUISANA, TEXAS
0903 " EIS, STRATEGIC PETROLEUM RESERVE, ENVIRONMENTAL EFFECTS, STORAGE, LOUISIANA, TEXAS
0904 " EIS, STRATEGIC PETROLEUM RESERVE, ENVIRONMENTAL EFFECTS, STORAGE, LOUISIANA, TEXAS
0905 " EIS, STRATEGIC PETROLEUM RESERVE, ENVIRONMENTAL EFFECTS, STORAGE, LOUISIANA, TEXAS
0906 " EIS, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, LOUISIANA
0907 " EIS, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, TEXAS
0915 " EIS, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, TEXAS
0925 " BIODEGRADATION, ALASKA , ENVIRONMENTAL EFFECTS, TOXICITY, *PROCEEDINGS

0926 CRUDE OIL, CHEMICAL EFFECTS, ALASKA , ENVIRONMENTAL EFFECTS, PHYSICAL EFFECTS, SOIL, SUBARCTIC REGIONS, *TUNDRA
0930 " CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, ALASKA , PHYSICAL EFFECTS, SOIL, PLANTS, MORTALITY, RECOVERY, *BLACK SPRUCE, *TUNDRA
0934 " CHRONIC EFFECTS, BACTERIA, ARCTIC, FATE, SOIL, FUNGI, PLANTS, ENVIRONMENTAL EFFECTS, *TUNDRA
0935 " CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, FATE, SOIL, PHYSICAL EFFECTS, FUNGI, PLANTS, *TUNDRA
0938 " ENVIRONMENTAL EFFECTS, PETROLEUM PRODUCTS, DEVELOPMENT, OIL-GAS LEASING, MARINE ORGANISMS, MARINE MAMMALS
0949 " BIODEGRADATION, ARCTIC, FERTILIZATION, FRESHWATER, *TUNDRA
0951 " BIODEGRADATION, SOIL, SLUDGE
0953 " CANADA, BIODEGRADATION, FUNGI, SOILS, HYDROCARBONS , *N-ALKANES
0959 " BIOLOGICAL EFFECTS, BIODEGRADATION, ALASKA , SOIL, PLANTS
0972 " OIL SLICKS, MOVEMENT, OIL INDUSTRY, TANKERS, DELAWARE BAY
0988 " COLD CLIMATES, CHROMATOGRAPHY, BIODEGRADATION, AROMATIC HYDROCARBONS, WSF, EVAPORATION, WSF, CRUDE OIL
0994 " ALASKA , FUEL OIL, SOIL, FATE, BIODEGRATION, SUBARCTIC REGIONS
0995 " OFFSHORE, DEVELOPMENT, PLATFORMS, ENVIRONMENTAL EFFECTS, MARINE ENVIRONMENT, FISH, MICROORGANISMS, SEDIMENTS
1022 " DEVELOPMENT, SOCIOECONOMIC EFFECTS, OIL SPILLS, SOLID WASTES, KUWAIT
1058 " HYDROCARBONS , PETROLEUM PRODUCTS, OIL TRANSFER, OIL TERMINALS, LEAKAGE, POLLUTION CONTROL, TANKERS
1076 " COALESCENCE
R070 " REMOTE SENSING, OIL SPILLS, WEATHERING, SOURCE IDENTIFICATION, PHYSICAL ASPECTS
1035 CRUDE OIL WASHING, TANKERS, SAFETY, POLLUTION PREVENTION, SEGREGATED BALLAST, IMCO, INTERNATIONAL CONVENTIONS, STATISTICS
1051 " TANKERS, POLLUTION PREVENTION, IMCO
0846 CRUSTACEANS, BIOLOGICAL EFFECTS, WSF, TOXICITY, MORTALITY
0853 " CRUDE OIL, ACUTE EFFECTS, HYDROCARBONS , WSF, FISH, MORTALITY, TOXICITY, *TEMPERATURE EFFECTS
0857 " SUBLETHAL EFFECTS, FUEL OIL, WSF, GROWTH, REPRODUCTION
0864 " BIOASSAY, HYDROCARBONS , SUBLETHAL EFFECTS, FISH
0884 " DISPERSANTS, TOXICITY, MORTALITY, GROWTH, *IDOTEA BALTICA
R076 " BIOLOGICAL EFFECTS, HYDROCARBONS , FISH, MOLLUSKS, TOXICITY
0916 DEEPWATER PORTS, OFFSHORE, DEVELOPMENT, OCS, ENVIRONMENTAL EFFECTS, OIL-GAS LEASING
1001 " TANKERS, ENVIRONMENTAL EFFECTS, OFFSHORE, ECONOMIC EFFECTS, GULF OF MEXICO, LOUISIANA
1040 " ALASKA , TANKERS, POLLUTION PREVENTION, SAFETY, *VALDEZ NARROWS
0809 DELAWARE, SPILL COOPERATIVES, OIL INDUSTRY, SPILL RESPONSE, POLLUTION PREVENTION, POLLUTION CONTROL, RIVERS
0874 DELAWARE BAY, CRUDE OIL, BIOLOGICAL EFFECTS, PETROLEUM PRODUCTS, SOURCES, TOXICITY, FISH, SHELLFISH, *URBAN RUNOFF
0972 " CRUDE OIL, OIL SLICKS, MOVEMENT, OIL INDUSTRY, TANKERS
1072 " SAFETY, OIL TRANSPORT, OIL TRANSFER, TANKERS, POLLUTION PREVENTION, REGULATIONS
0819 DENMARK, CANADA, INTERNATIONAL AGREEMENTS, POLLUTION PREVENTION, OFFSHORE, SPILL CLEANUP, GREENLAND
0858 DEPURATION, BIOLOGICAL EFFECTS, HYDROCARBONS , MARINE ORGANISMS, UPTAKE, MOLLUSKS, *BIVALVES
0871 " BIOLOGICAL EFFECTS, HYDROCARBONS , UPTAKE, MOLLUSKS, *TAPES SEMIDECUSSATA
0873 " CRUDE OIL, AROMATIC HYDROCARBONS, UPTAKE, FISH, *ANGUILLA JAPONICA, *SULFUR
0886 " AROMATIC HYDRCARBONS, FISH, UPTAKE, METABOLISM, *NAPHTHALENE
R074 " CHEMICAL ANALYSIS, BIOASSAY, FUEL OIL, WSF, TOXICITY, UPTAKE, FRESHWATER
0681 DESIGN-ENGINEERING, CONTAMINATION, OIL SLICKS, DETECTION, EQUIPMENT, PATENT
0682 " BACTERIA, DETECTION, HYDROCARBONS , SHIPS, POLLUTION CONTROL, *ENZYME ELECTRODE
0691 " DETECTION, EQUIPMENT, PATENT
0692 " DETECTION, OIL SLICKS, EQUIPMENT, PATENT
0737 " SAMPLING, HYDROCARBONS , SEAWATER, EQUIPMENT
0754 " SPILL CONTAINMENT, EQUIPMENT, *PNEUMATIC BARRIER
0755 " BOOMS, SPILL CONTAINMENT, EQUIPMENT, PERFORMANCE TESTIING, *PNEUMATIC BARRIER
0756 " BOOMS, SPILL CONTAINMENT, PATENT
0757 " BOOMS, SPILL CONTAINMENT, EQUIPMENT, PATENT
0758 " BOOMS, SPILL CONTAINMENT, EQUIPMENT, OIL-WATER SEPARATION, PATENT
0759 " BOOMS, SPILL CONTAINMENT, PATENT
0760 " BOOMS, SPILL CONTAINMENT, PATENT
0761 " SPILL CLEANUP, SPILL REMOVAL, SKIMMERS, SHIPS, OIL-WATER SEPARATION
0762 " SPILL CLEANUP, SKIMMERS, SHIPS, EQUIPMENT, PRODUCT INFORMATION
0765 " SPILL CLEANUP, OIL REMOVAL, SKIMMERS, SHIPS, TANKERS, EQUIPMENT, PRODUCT INFORMATION
0766 " SPILL CLEANUP, SPILL REMOVAL, EQUIPMENT, FRANCE
0768 " SHIPS, SPILL CLEANUP, POLLUTION CONTROL, OCEANS, FRANCE
0771 " SPILL CLEANUP, SPILL REMOVAL, EQUIPMENT, PATENT
0773 " SPILL REMOVAL, PATENT
0774 " SPILL CLEANUP, SKIMMERS, EQUIPMENT, PERFORMANCE TESTING, *OHMSETT
0775 " OIL REMOVAL, TANKERS, PATENT, *PUMPING

0776 DESIGN-ENGINEERING, OIL REMOVAL, TANKERS, EQUIPMENT, PATENT
0778 " SPILL CLEANUP, SKIMMERS, EQUIPMENT, PATENT
0780 " SPILL CLEANUP, EQUIPMENT, UK, PERFORMANCE TESTING, PRODUCT INFORMATION, *INVICTACAT
0784 " SPILL REMOVAL, EQUIPMENT, PATENT
0785 " SPILL REMOVAL, SKIMMERS, EQUIPMENT, PATENT
0791 " AMOCO CADIZ SPILL, SPILL REMOVAL, EQUIPMENT, *OIL MOP
0793 " BOOMS, SPILL CLEANUP, SKIMMERS, EQUIPMENT, PERFORMANCE TESTING, *OHMSETT
0794 " BOOMS, SPILL CLEANUP, SKIMMERS, EQUIPMENT, PERFORMANCE TESTING, *OHMSETT
0796 " SPILL CLEANUP, SKIMMERS, PATENT
0797 " OIL REMOVAL, SHIPS, EQUIPMENT, PATENT
0799 " SPILL CLEANUP, SKIMMERS, SHIPS, OIL-WATER SEPARATION, EQUIPMENT, PATENT
0800 " SPILL REMOVAL, SKIMMERS, EQUIPMENT, PATENT
0802 " SPILL CLEANUP, SKIMMERS, EQUIPMENT, PATENT
0805 " SPILL REMOVAL, SKIMMERS, EQUIPMENT, PATENT
0806 " POLLUTION CONTROL, EQUIPMENT, SPILL CLEANUP, PERFORMANCE TESTING, *TOWED PLANING SLED
0823 " BLOWOUT PREVENTION, OIL WELLS, DRILLING, OFFSHORE, POLLUTION PREVENTION, SAFETY, EQUIPMENT
0831 " BLOWOUT PREVENTION, EQUIPMENT, DRILLING
1045 " TANKERS, OIL TRANSPORT, EQUIPMENT, REGULATIONS, SEGREGATED BALLAST
1047 " ARCTIC, TANKERS, ECONOMICS, RISK ANALYSIS, OIL TRANSPORT, *SUBMARINE TANKERS
1048 " TANKERS, PERFORMANCE TESTING, POLLUTION PREVENTION, *SINKING TESTS
1053 " PIPELINES, REFINERIES, LEAKAGE, DETECTION, MONITORING, EQUIPMENT, PATENT
1055 " PIPELINES, LEAKAGE, DETECTION, EQUIPMENT, PATENT
1102 " OIL-WATER SEPARATION, POLLUTION PREVENTION, EQUIPMENT
1104 " OIL-WATER SEPARATION, PATENT
0681 DETECTION, DESIGN-ENGINEERING, CONTAMINATION, OIL SLICKS, EQUIPMENT, PATENT
0682 " DESIGN-ENGINEERING, BACTERIA, HYDROCARBONS , SHIPS, POLLUTION CONTROL, *ENZYME ELECTRODE
0683 " COLD CLIMATES, OIL SPILLS, ICE
0684 " CRUDE OIL, OIL SLICKS, SEA SURFACE, PHYSICAL ASPECTS, *CAPACITANCE, *LASER REFLECTANCE
0685 " ANALYTICAL TECHNIQUES, HYDROCARBONS , REFINERIES, *PROCEEDINGS
0686 " CONTAMINATION, BIOLOGICAL EFFECTS, BIOINDICATORS, MONITORING, TOXICITY
0687 " MODELS, OIL SPILLS, MOVEMENT, MONITORING, REMOTE SENSING
0689 " CHROMATOGRAPHY, PETROLEUM PRODUCTS, WASTEWATERS, *HEAD-SPACE METHOD
0691 " DESIGN-ENGINEERING, EQUIPMENT, PATENT
0692 " DESIGN-ENGINEERING, OIL SLICKS, EQUIPMENT, PATENT
0694 " REMOTE SENSING, USCG, SURVEILLANCE, *RADAR SYSTEM
0695 " REMOTE SENSING, MONITORING, OIL SLICKS, TANKERS, SHIPS, SWEDEN
0696 " REMOTE SENSING, HYDROCARBONS , OIL SLICKS, MONITORING, *PROCEEDINGS
0697 " ANALYTICAL TECHNIQUES, REMOTE SENSING, MONITORING, *AIRBORNE LASER
0698 " ANALYTICAL TECHNIQUES, REMOTE SENSING, MONITORING, SOURCE IDENTIFICATION, *SPECTRAL SIGNATURES
0700 " REMOTE SENSING, MODELS, SEA SURFACE
0702 " REMOTE SENSING, OIL SPILLS, SURVEILLANCE
0703 " REMOTE SENSING, MONITORING, MOVEMENT, GREAT LAKES, *LANDSAT, *ERTS
0706 " CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, PAH
0707 " CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, PAH, SAMPLING, SEDIMENTS, FRESHWATER
0708 " CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS, HYDROCARBONS , ENVIRONMENTAL EFFECTS, SEDIMENTS
0710 " CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, PETROCHEMICALS, *FLUORESCENCE
0713 " ANALYTICAL TECHNIQUES, SAMPLING, *OIL-IN-WATER ANALYSIS
0716 " CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, GC/MS, HYDROCARBONS , FRESHWATER, *FLAME IONIZATION, *FLAME PHOTOMETRY
0723 " CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, PAH, LAKES , *AIR-WATER INTERFACE, LOUISIANA
0729 " CHEMICAL ANALYSIS, SPECTROMETRY, PETROLEUM PRODUCTS, *FLUORESCENCE SPECTROPHOTOMETRY
0730 " CHROMATOGRAPHY, AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES
0734 " ANALYTICAL TECHNIQUES, *XAD RESINS
0743 " CHROMATOGRAPHY, ANIMALS, ANALYTICAL TECHNIQUES, HYDROCARBONS , PETROLEUM PRODUCTS, *RUMINANTS
1053 " DESIGN-ENGINEERING, PIPELINES, REFINERIES, LEAKAGE, MONITORING, EQUIPMENT, PATENT
1054 " PIPELINES, LEAKAGE, MONITORING, EQUIPMENT, NORTH SEA, UK
1055 " DESIGN-ENGINEERING, PIPELINES, LEAKAGE, EQUIPMENT, PATENT
R071 " REMOTE SENSING, OIL SPILLS, PERFORMANCE TESTING, SANTA BARBARA CHANNEL, *IR
0812 DEVELOPMENT, SOCIOECONOMIC EFFECTS, ENVIRONMENTAL EFFECTS, MEDITERRANEAN SEA
0813 " COASTAL ZONE MANAGEMENT, OFFSHORE, GEORGES BANK, MASSACHUSETTS
0825 " CORAL REEFS, CONSERVATION, OIL-GAS LEASING, OFFSHORE, DRILLING, SEDIMENTATION, NOAA, GULF OF MEXICO, *MARINE SANCTUARY
0898 " OCS, OIL-GAS LEASING, OFFSHORE, FISH, WILDLIFE, HABITATS, OIL TRANSPORT, ENVIRONMENTAL EFFECTS
0914 " OIL SHALE, ENVIRONMENTAL EFFECTS, DOE
0916 " DEEPWATER PORTS, OFFSHORE, OCS, ENVIRONMENTAL EFFECTS, OIL-GAS LEASING
0918 " OCS, OIL-GAS LEASING, OFFSHORE, ECOSYSTEMS, ENVIRONMENTAL EFFECTS, ONSHORE IMPACTS

0920 DEVELOPMENT, LEGISLATION, INTERNATIONAL CONVENTIONS, LIABILITY, COMPENSATION, NORTH SEA, UK, NORWAY, OFFSHORE
0922 " BEHAVIOR, ANALYTICAL TECHNIQUES,ENVIRONMENTAL EFFECTS, MONITORING, REFINERIES, WASTEWATERS, FATE, POLLUTION CONTROL, HEALTH HAZARDS, *PROCEEDINGS
0927 " COASTAL ZONE MANAGEMENT, ENVIRONMENTAL EFFECTS, OFFSHORE, OCS, OIL-GAS LEASING
0938 " CRUDE OIL, ENVIRONMENTAL EFFECTS, PETROLEUM PRODUCTS, OIL-GAS LEASING, MARINE ORGANISMS, MARINE MAMMALS
0995 " CRUDE OIL, OFFSHORE, PLATFORMS, ENVIRONMENTAL EFFECTS, MARINE ENVIRONMENT, FISH, MICROORGANISMS, SEDIMENTS
1003 " OCS, OIL-GAS LEASING, OFFSHORE, REGULATIONS, GOVERNMENT AGENCIES, *US FISH & WILDLIFE SERVICE
1005 " COASTAL ZONE MANAGEMENT, OIL-GAS LEASING, LEGISLATION, REGULATIONS, RESOURCE MANAGEMENT, OCS, *PUBLIC PARTICIPATION
1006 " OIL INDUSTRY, FISHERIES, RESOURCE MANAGEMENT, OFFSHORE, NORTH SEA, UK
1010 " CANADA, ARCTIC, DRILLING, ENVIRONMENTAL EFFECTS, WILDLIFE, LIABILITY, RISK ANALYSIS, *LANCASTER SOUND
1013 " CALIFORNIA, OCS, OIL-GAS LEASING, ENVIRONMENTAL EFFECTS, OFFSHORE, SANTA BARBARA CHANNEL
1014 " FOSSIL FUELS, ENVIRONMENTAL EFFECTS
1016 " ATLANTIC COAST, OCS, OIL-GAS LEASING, OFFSHORE, ENVIRONMENTAL EFFECTS, SOCIOECONOMIC EFFECTS
1019 " OCS, OIL-GAS LEASING, OFFSHORE, ENVIRONMENTAL EFFECTS, ONSHORE IMPACTS, GULF OF ALASKA, OREGON, WASHINGTON
1021 " OCS, OIL-GAS LEASING, OFFSHORE, ONSHORE IMPACTS, ENVIRONMENTAL EFFECTS, WETLANDS, GULF OF MEXICO
1022 " CRUDE OIL, SOCIOECONOMIC EFFECTS, OIL SPILLS, SOLID WASTES, KUWAIT
1025 " OCS, OIL-GAS LEASING, SAFETY, ENVIRONMENTAL EFFECTS, USCG
1026 " OCS, OIL-GAS LEASING, OFFSHORE, ENVIRONMENTAL EFFECTS, SOCIOECONOMIC EFFECTS, GEORGES BANK, *NEW ENGLAND
1027 " OCS, OFFSHORE, PRODUCTION, TANKERS, OIL TRANSPORT, REFINING, INTERNATIONAL AGREEMENTS, *CHINA SEA, *MARINE REGIONALISM
1030 " BASELINE STUDIES, OIL INDUSTRY, RESOURCE MANAGEMENT, LOUISIANA
1043 " TANKERS, SHIPS, OCS, PORTS
R083 " ANIMALS, DRILLING, ONSHORE IMPACTS, HABITATS, DISTRIBUTION, *ELK
0764 DISPERSANTS, BIODEGRADATION, SPILL CLEANUP, SHIPS, PERFORMANCE TESTING, POLLUTION CONTROL, NEW YORK, *COREXIT 9527
0769 " SURFACTANTS, SPILL CLEANUP, SEA SURFACE, PATENT
0786 " BIODEGRADATION, SPILL CLEANUP, TOXICITY
0792 " BIODEGRADATION, SPILL REMOVAL, WEATHERING, ENVIRONMENTAL EFFECTS
0804 " CONTINGENCY PLANNING, CHEMICAL EFFECTS, CALIFORNIA, BIOLOGICAL EFFECTS, SPILL CLEANUP, PERFORMANCE TESTING
0814 " CONTINGENCY PLANNING, BEACH CLEANUP, SPILL RESPONSE, FUEL OIL, POLLUTION PREVENTION, TANKERS
0826 " CONTINGENCY PLANNING, POLLUTION CONTROL, SPILL CLEANUP, SPILL RESPONSE, EQUIPMENT, UK
0884 " CRUSTACEANS, TOXICITY, MORTALITY, GROWTH, *IDOTEA BALTICA
0887 " CONCENTRATIONS, TOXICITY, MARINE ORGANISMS, MORTALITY, MOLLUSKS
0931 " CONTINGENCY PLANNING, BEHAVIOR, OIL TRANSPORT, EQUIPMENT, LEGISLATION, SPILL RESPONSE, POLLUTION PREVENTION, POLLUTION CONTROL, *CONFERENCE
1039 " BIOLOGICAL EFFECTS, SPILL RESPONSE, POLLUTION CONTROL, WILDLIFE, FISHERIES, UK, *CHRISTOS BITAS SPILL
0717 DISPERSION, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, HYDROCARBONS
0985 " MODELS, OIL SPILLS, *WAVE ACTION
R081 " MODELS, SPILL TRAJECTORIES, MOVEMENT, RIVERS
0712 DISTRIBUTION, BIOGENIC HYDROCARBONS, BASELINE STUDIES, ALASKA , HYDROCARBONS , NATURAL SEEPS, MONITORING, OCS
0746 " CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS, SOURCE IDENTIFICATION, HYDROCARBONS , *ALKANES
0876 " BENTHOS, MARINE ORGANISMS, ENVIRONMENTAL EFFECTS, INTERTIDAL ZONE, SCOTLAND
0912 " BIOGENIC HYDROCARBONS, BEAUFORT SEA, BASELINE STUDIES, ALASKA , HYDROCARBONS , SEDIMENTATION, OCS
0923 " BIOLOGICAL EFFECTS, BIODEGRADATION, EKOFISK BLOWOUT, FATE, DRIFT, HYDROCARBONS , NORTH SEA
0992 " SOURCES, STATISTICS, OIL INDUSTRY, OIL TRANSPORT, TAR, NORTH SEA
0999 " SOURCES, REFINERIES, WASTEWATERS, HYDROCARBONS , FATE, *PERSISTENCE
R078 " BIODEGRADATION, MICROORGANISMS, OCEANS
R079 " BERMUDA, HYDROCARBONS , FATE, SEDIMENTS, TAR, MODELS
R082 " ALASKA , MODELS, HYDROCARBONS , MOVEMENT, OIL-GAS LEASING
R083 " DEVELOPMENT, ANIMALS, DRILLING, ONSHORE IMPACTS, HABITATS, *ELK
0914 DOE, DEVELOPMENT, OIL SHALE, ENVIRONMENTAL EFFECTS
0923 DRIFT, DISTRIBUTION, BIOLOGICAL EFFECTS, BIODEGRADATION, EKOFISK BLOWOUT, FATE, HYDROCARBONS , NORTH SEA
0983 " OIL SLICKS, SPREADING, SEA SURFACE
0986 " BEHAVIOR, OIL SPILLS, MODELS, SPILL TRAJECTORIES, SEA SURFACE, PREDICITIONS
0987 " BEHAVIOR, MODELS, SPILL TRAJECTORIES, NEW YORK

0998 DRIFT, ICE, OFFSHORE, DRILLING, SAFETY, OIL SPILLS, MODELS, GREENLAND, *DAVIS STRAIT
0825 DRILLING, DEVELOPMENT, CORAL REEFS, CONSERVATION, OIL-GAS LEASING, OFFSHORE, SEDIMENTATION, NOAA, GULF OF MEXICO, *MARINE SANCTUARY
0827 " BLOWOUT PREVENTION, OFFSHORE, POLLUTION PREVENTION, EQUIPMENT, MEDITERRANEAN SEA, NORTH SEA
0829 " DESIGN-ENGINEERING, BLOWOUT PREVENTION, OIL WELLS, OFFSHORE, POLLUTION PREVENTION, SAFETY, EQUIPMENT
0831 " DESIGN-ENGINEERING, BLOWOUT PREVENTION, EQUIPMENT
0833 " BLOWOUTS, OIL WELLS, POLLUTION CONTROL
0896 " COLD CLIMATES, CANADA, BLOWOUTS, EIS, OFFSHORE, ICE, *LANCASTER SOUND
0996 " BIOLOGICAL EFFECTS, BENTHOS, EXPLORATION, INVERTEBRATES, *DRILLING MUDS
0997 " BIOLOGICAL EFFECTS, BENTHOS, INVERTEBRATES, *BARITE, *DRILLING MUDS
0998 " DRIFT, ICE, OFFSHORE, SAFETY, OIL SPILLS, MODELS, GREENLAND, *DAVIS STRAIT
1007 " OFFSHORE, OIL-GAS LEASING, PRODUCTION, ENVIRONMENTAL EFFECTS, SAFETY
1008 " CHRONIC EFFECTS, BLM, OCS, PRODUCTION, PLATFORMS, LOUISIANA, GULF OF MEXICO
1009 " CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, OFFSHORE, PRODUCTION, PHYSICAL EFFECTS, LOUISIANA, *OFFSHORE ECOLOGY INVESTIGATION
1010 " DEVELOPMENT, CANADA, ARCTIC, ENVIRONMENTAL EFFECTS, WILDLIFE, LIABILITY, RISK ANALYSIS, *LANCASTER SOUND
1023 " ENVIRONMENTAL EFFECTS, OCS, WASTEWATERS, HYDROCARBONS , *BATEA, *NSPS
R083 " DISTRIBUTION, DEVELOPMENT, ANIMALS, ONSHORE IMPACTS, HABITATS, *ELK
0939 ECONOMIC EFFECTS, ENVIRONMENTAL EFFECTS, FRESHWATER, ST. LAWRENCE RIVER, WILDLIFE, FISH, FAL, MARSHES, *NEPCO 140 SPILL
1001 " DEEPWATER PORTS, TANKERS, ENVIRONMENTAL EFFECTS, OFFSHORE, GULF OF MEXICO, LOUISIANA
1113 " COST ANALYSIS, POLLUTION CONTROL, REFINERIES, OIL INDUSTRY
0893 ECONOMICS, COST ANALYSIS, SOCIOECONOMIC EFFECTS, ONSHORE IMPACTS, OIL SPILLS, SANTA BARBARA CHANNEL
1047 " DESIGN-ENGINEERING, ARCTIC, TANKERS, RISK ANALYSIS, OIL TRANSPORT, *SUBMARINE TANKERS
1069 " COST ANALYSIS, GASOLINE, OIL TRANSFER, POLLUTION PREVENTION, REGULATIONS, GUIDELINES
0848 ECOSYSTEMS, COASTS, CHRONIC EFFECTS, HYDROCARBONS , *WETLANDS
0855 " PAH, TOXICITY, OIL INDUSTRY, OIL DISCHARGES
0918 " DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, ENVIRONMENTAL EFFECTS, ONSHORE IMPACTS
0932 " OIL SPILLS, ENVIRONMENTAL EFFECTS, PLANTS, INVERTEBRATES, REMOTE SENSING, *MANGROVE FORESTS
0981 " BERING SEA, MODELS, MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS
1024 " ARCTIC, MARINE MAMMALS, RESOURCE MANAGEMENT, MODELS
0896 EIS, DRILLING, COLD CLIMATES, CANADA, BLOWOUTS, OFFSHORE, ICE, *LANCASTER SOUND
0900 " CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, TEXAS
0901 " CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS
0902 " CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, LOUSISANA, TEXAS
0903 " CRUDE OIL, STRATEGIC PETROLEUM RESERVE, ENVIRONMENTAL EFFECTS, STORAGE, LOUISIANA, TEXAS
0904 " CRUDE OIL, STRATEGIC PETROLEUM RESERVE, ENVIRONMENTAL EFFECTS, STORAGE, LOUISIANA, TEXAS
0905 " CRUDE OIL, STRATEGIC PETROLEUM RESERVE, ENVIRONMENTAL EFFECTS, STORAGE, LOUISIANA, TEXAS
0906 " CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, LOUISIANA
0907 " CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, TEXAS
0910 " OCS, OIL-GAS LEASING, ENVIRONMENTAL EFFECTS, ONSHORE IMPACTS
0911 " ANTARCTICA,BASELINE STUDIES, MONITORING, MODELS, ENVIRONMENTAL EFFECTS
0915 " CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, TEXAS
0763 EKOFISK BLOWOUT, SPILL CLEANUP, SPILL CONTAINMENT, EQUIPMENT, NORTH SEA
0923 " DRIFT, DISTRIBUTION, BIOLOGICAL EFFECTS, BIODEGRADATION, FATE, HYDROCARBONS , NORTH SEA
0946 " BIOLOGICAL EFFECTS, FATE, INTERNATIONAL AGREEMENTS, NORTH SEA
0803 EMULSIONS, ADSORPTION, SPILL CLEANUP, SORBENTS, PATENT
1084 " OIL-WATER SEPARATION, WASTEWATERS, WASTEWATER TREATMENT, PATENT
1089 " WASTEWATER TREATMENT, OIL-WATER SEPARATION, OXIDATION, FILTRATION, PATENT
1090 " FILTRATION, WASTEWATER TREATMENT, COMBUSTION, PATENT
1094 " WASTEWATER TREATMENT, PATENT
1105 " OIL-WATER SEPARATION, HYDROCARBONS , PATENT
1041 ENGLISH CHANNEL, TANKERS, OIL TRANSPORT, SAFETY, INTERNATIONAL AGREEMENTS, MONITORING, REGULATIONS
0708 ENVIRONMENTAL EFFECTS, DETECTION, CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS, HYDROCARBONS , SEDIMENTS
0792 " DISPERSANTS, BIODEGRADATION, SPILL REMOVAL, WEATHERING
0795 " CRUDE OIL, BURNING, ALASKA , PLANTS, SOIL, RECOVERY, GROWTH
0801 " BIRDS, ANIMALS, OIL SPILLS, SPILL CLEANUP, MORTALITY, SCOTLAND, *ESSO BERNICIA SPILL
0812 " DEVELOPMENT, SOCIOECONOMIC EFFECTS, MEDITERRANEAN SEA

0847 ENVIRONMENTAL EFFECTS, CANADA, BEHAVIOR, OIL SPILLS, MARINE MAMMALS, MORTALITY, *BRITISH COLUMBIA, *ENHYDRA LUTRIS
0860 " CONTINGENCY PLANNING, BIOLOGICAL EFFECTS, OIL SPILLS, SPILL RESPONSE
0876 " DISTRIBUTION, BENTHOS, MARINE ORGANISMS, INTERTIDAL ZONE, SCOTLAND
0894 " COLD CLIMATES, CANADA, OIL SPILLS, ICE
0898 " DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, FISH, WILDLIFE, HABITATS, OIL TRANSPORT
0899 " CRUDE OIL,EIS, STRATEGIC PETROLEUM RESERVE, STORAGE, TEXAS
0900 " EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, TEXAS
0901 " EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE
0902 " EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, LOUSISANA, TEXAS
0903 " EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, LOUISIANA, TEXAS
0904 " EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, LOUISIANA, TEXAS
0905 " EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, LOUISIANA, TEXAS
0906 " EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, LOUISIANA
0907 " EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, TEXAS
0910 " EIS, OCS, OIL-GAS LEASING, ONSHORE IMPACTS
0911 " EIS, ANTARCTICA,BASELINE STUDIES, MONITORING, MODELS
0914 " DOE, DEVELOPMENT, OIL SHALE
0915 " EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, TEXAS
0916 " DEVELOPMENT, DEEPWATER PORTS, OFFSHORE, OCS, OIL-GAS LEASING
0918 " ECOSYSTEMS, DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, ONSHORE IMPACTS
0925 " CRUDE OIL, BIODEGRADATION, ALASKA , TOXICITY, *PROCEEDINGS
0926 " CRUDE OIL, CHEMICAL EFFECTS, ALASKA , PHYSICAL EFFECTS, SOIL, SUBARCTIC REGIONS, *TUNDRA
0927 " DEVELOPMENT, COASTAL ZONE MANAGEMENT, OFFSHORE, OCS, OIL-GAS LEASING
0928 " FOSSIL FUELS, OIL SHALE, RISK ANALYSIS
0932 " ECOSYSTEMS, OIL SPILLS, PLANTS, INVERTEBRATES, REMOTE SENSING, *MANGROVE FORESTS
0933 " BEACHES, BALLAST , OIL TERMINALS, TANKERS, OIL DISCHARGES, SCOTLAND, *SHETLAND ISLANDS
0934 " CRUDE OIL, CHRONIC EFFECTS, BACTERIA, ARCTIC, FATE, SOIL, FUNGI, PLANTS, *TUNDRA
0936 " CHRONIC EFFECTS, AFRICA, OIL SPILLS, RECOVERY, TANKERS, *VENPET-VENOIL SPILL
0938 " DEVELOPMENT, CRUDE OIL, PETROLEUM PRODUCTS, OIL-GAS LEASING, MARINE ORGANISMS, MARINE MAMMALS
0939 " ECONOMIC EFFECTS, FRESHWATER, ST. LAWRENCE RIVER, WILDLIFE, FISH, PAH, MARSHES, *NEPCO 140 SPILL
0942 " CONTAMINATION, FATE, WASTEWATERS, NEW YORK, *NEW YORK BIGHT
0943 " CANADA, FRESHWATER
0944 " BALTIC SEA, INDUSTRIES, PETROLEUM PRODUCTS, OIL SHALE, PRODUCTION, EXTRACTION, DISCHARGES, POLLUTION CONTROL
0945 " POLLUTION PREVENTION, POLLUTION CONTROL, OIL SPILLS, SPILL CLEANUP, EPA, *RESEARCH SUMMARY
0947 " COST ANALYSIS, SOURCES, POLLUTION CONTROL, FATE, MODELS, LEGISLATION, RESOURCE MANAGEMENT
0981 " ECOSYSTEMS, BERING SEA, MODELS, MARINE ENVIRONMENT
0990 " BIODEGRADATION, PETROLEUM PRODUCTS, TOXICITY, MICROORGANISMS, SEDIMENTS
0991 " BEHAVIOR, STATISTICS, FATE, MARINE ENVIRONMENT
0995 " DEVELOPMENT, CRUDE OIL, OFFSHORE, PLATFORMS, MARINE ENVIRONMENT, FISH, MICROORGANISMS, SEDIMENTS
1001 " ECONOMIC EFFECTS, DEEPWATER PORTS, TANKERS, OFFSHORE, GULF OF MEXICO, LOUISIANA
1004 " OIL INDUSTRY, GUIDELINES, REGULATIONS, STATISTICS, EUROPE
1007 " DRILLING, OFFSHORE, OIL-GAS LEASING, PRODUCTION, SAFETY
1010 " DRILLING, DEVELOPMENT, CANADA, ARCTIC, WILDLIFE, LIABILITY, RISK ANALYSIS, *LANCASTER SOUND
1011 " OIL SHALE, REGULATION, WASTEWATERS, RESOURCE MANAGEMENT, MODELS, COLORADO
1012 " BIBLIOGRAPHIES, OIL SHALE, RESOURCE MANAGEMENT, WASTEWATERS, REGULATIONS, GROUNDWATER, COLORADO
1013 " DEVELOPMENT, CALIFORNIA, OCS, OIL-GAS LEASING, OFFSHORE, SANTA BARBARA CHANNEL
1014 " DEVELOPMENT, FOSSIL FUELS
1016 " DEVELOPMENT, ATLANTIC COAST, OCS, OIL-GAS LEASING, OFFSHORE, SOCIOECONOMIC EFFECTS
1017 " TRANS-ALASKA PIPELINE, MONITORING, *CONSTRUCTION
1018 " COASTAL ZONE MANAGEMENT, FATE, SOURCES, FISHERIES
1019 " DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, ONSHORE IMPACTS, GULF OF ALASKA, OREGON, WASHINGTON
1020 " OFFSHORE, OIL-GAS LEASING, OIL FIELDS, MODELS, TEXAS
1021 " DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, ONSHORE IMPACTS, WETLANDS, GULF OF MEXICO
1023 " DRILLING, OCS, WASTEWATERS, HYDROCARBONS , *BATEA, *NSPS
1025 " DEVELOPMENT, OCS, OIL-GAS LEASING, SAFETY, USCG
1026 " DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, SOCIOECONOMIC EFFECTS, GEORGES BANK, *NEW ENGLAND
1029 " WASTEWATERS, REFINING, MARINE ENVIRONMENT
1038 " BAYS, OIL SPILLS, TANKERS, SPREADING, SPILL CLEANUP, IRELAND, *BETELGEUSE SPILL
1056 " OIL SPILLS, FUEL OIL, SPILL RESPONSE, OIL TERMINALS, SCOTLAND, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL

1060	ENVIRONMENTAL EFFECTS, COASTS, BIRDS, OIL TERMINALS, TANKERS, OIL SPILLS, FUEL OIL, MORTALITY, WILDLIFE, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1061	" OIL TERMINALS, TANKERS, OIL SPILLS, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1071	" ALASKA , POLLUTION PREVENTION, OIL TRANSPORT, TANKERS, TRANS-ALASKA PIPELINE
1092	" OIL SHALE, DISPOSAL
1108	" CRANKCASE OIL, WASTE OIL, DISPOSAL, HEALTH HAZARDS, RECLAMATION, RECYCLING, US, LEGISLATION, STATE GOVERNMENTS, EUROPE
1110	" RECLAMATION, REFINING, RECYCLING, LUBRICATING OIL, WASTE OIL
0745	EPA, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, WEATHERING, LAW ENFORCEMENT
0817	" CONTINGENCY PLANNING, SPILL RESPONSE, OIL INDUSTRY, GUIDELINES, *INLAND SPILLS
0818	" LEGISLATION, SPILL CLEANUP, SPILL REMOVAL, LIABILITY, INSURANCE, REGULATIONS, *SUPERFUND
0832	" CONTAMINATION, CHEMICAL ANALYSIS, OIL SHALE, MONITORING, POLLUTION CONTROL, SAMPLING
0945	" ENVIRONMENTAL EFFECTS, POLLUTION PREVENTION, POLLUTION CONTROL, OIL SPILLS, SPILL CLEANUP, *RESEARCH SUMMARY
1099	" WASTEWATER TREATMENT, HEALTH HAZARDS, RIVERS, FLORIDA
1111	" OIL INDUSTRY, SOLID WASTES, LEGISLATION, REGULATIONS
0681	EQUIPMENT, DETECTION, DESIGN-ENGINEERING, CONTAMINATION, OIL SLICKS, PATENT
0691	" DETECTION, DESIGN-ENGINEERING, PATENT
0692	" DETECTION, DESIGN-ENGINEERING, OIL SLICKS, PATENT
0737	" DESIGN-ENGINEERING, SAMPLING, HYDROCARBONS , SEAWATER
0748	" SOURCE IDENTIFICATION, OIL TRANSFER, POLLUTION PREVENTION
0754	" DESIGN-ENGINEERING, SPILL CONTAINMENT, *PNEUMATIC BARRIER
0755	" DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, PERFORMANCE TESTIING, *PNEUMATIC BARRIER
0757	" DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, PATENT
0758	" DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, OIL-WATER SEPARATION, PATENT
0762	" DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, SHIPS, PRODUCT INFORMATION
0763	" EKOFISK BLOWOUT, SPILL CLEANUP, SPILL CONTAINMENT, NORTH SEA
0765	" DESIGN-ENGINEERING, SPILL CLEANUP, OIL REMOVAL, SKIMMERS, SHIPS, TANKERS, PRODUCT INFORMATION
0766	" DESIGN-ENGINEERING, SPILL CLEANUP, SPILL REMOVAL, FRANCE
0767	" AMOCO CADIZ SPILL, SPILL REMOVAL, SKIMMERS
0771	" DESIGN-ENGINEERING, SPILL CLEANUP, SPILL REMOVAL, PATENT
0772	" BOOMS, SPILL CLEANUP, SHIPS, DISIGN-ENGINEERING, PATENT
0774	" DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, PERFORMANCE TESTING, *OHMSETT
0776	" DESIGN-ENGINEERING, OIL REMOVAL, TANKERS, PATENT
0778	" DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, PATENT
0780	" DESIGN-ENGINEERING, SPILL CLEANUP, UK, PERFORMANCE TESTING, PRODUCT INFORMATION, *INVICTACAT
0782	" ARCTIC, SPILL CLEANUP, PERFORMANCE TESTING, OIL-WATER SEPARATION
0783	" CRUDE OIL, BURNING, SPILL REMOVAL, OIL SLICKS, PERFORMANCE TESTING, *INCENDIARY DEVICES
0784	" DESIGN-ENGINEERING, SPILL REMOVAL, PATENT
0785	" DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS, PATENT
0791	" DESIGN-ENGINEERING, AMOCO CADIZ SPILL, SPILL REMOVAL, *OIL MOP
0793	" DESIGN-ENGINEERING, BOOMS, SPILL CLEANUP, SKIMMERS, PERFORMANCE TESTING, *OHMSETT
0794	" DESIGN-ENGINEERING, BOOMS, SPILL CLEANUP, SKIMMERS, PERFORMANCE TESTING, *OHMSETT
0797	" DESIGN-ENGINEERING, OIL REMOVAL, SHIPS, PATENT
0799	" DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, SHIPS, OIL-WATER SEPARATION, PATENT
0800	" DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS, PATENT
0802	" DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, PATENT
0805	" DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS, PATENT
0806	" DESIGN-ENGINEERING, POLLUTION CONTROL, SPILL CLEANUP, PERFORMANCE TESTING, *TOWED PLANING SLED
0822	" TANKERS, OIL DISCHARGES, REGULATIONS, IMCO, USCG, OIL-WATER SEPARATION
0826	" DISPERSANTS, CONTINGENCY PLANNING, POLLUTION CONTROL, SPILL CLEANUP, SPILL RESPONSE, UK
0827	" DRILLING, BLOWOUT PREVENTION, OFFSHORE, POLLUTION PREVENTION, MEDITERRANEAN SEA, NORTH SEA
0829	" DRILLING, DESIGN-ENGINEERING, BLOWOUT PREVENTION, OIL WELLS, OFFSHORE, POLLUTION PREVENTION, SAFETY
0831	" DRILLING, DESIGN-ENGINEERING, BLOWOUT PREVENTION
0931	" DISPERSANTS, CONTINGENCY PLANNING, BEHAVIOR, OIL TRANSPORT, LEGISLATION, SPILL RESPONSE, POLLUTION PREVENTION, POLLUTION CONTROL, *CONFERENCE
1045	" DESIGN-ENGINEERING, TANKERS, OIL TRANSPORT, REGULATIONS, SEGREGATED BALLAST
1050	" BALLAST , OIL DISCHARGES, TANKERS, SHIPS, OIL SLICKS, MONITORING
1053	" DETECTION, DESIGN-ENGINEERING, PIPELINES, REFINERIES, LEAKAGE, MONITORING, PATENT
1054	" DETECTION, PIPELINES, LEAKAGE, MONITORING, NORTH SEA, UK
1055	" DETECTION, DESIGN-ENGINEERING, PIPELINES, LEAKAGE, PATENT
1059	" TANKERS, OIL TRANSFER, POLLUTION PREVENTION
1077	" WASTE OIL TREATMENT, SLUDGES, REFINERIES, PETROCHEMICALS, USSR
1102	" DESIGN-ENGINEERING, OIL-WATER SEPARATION, POLLUTION PREVENTION
R084	" FUEL OIL, WASTEWATER TREATMENT, POLLUTION PREVENTION

R085 EQUIPMENT, WASTEWATER TREATMENT, RECYCLING, PERFORMANCE TESTING, *MICRO-GAS-DISPERSION STRIPPING
0828 EUROPE, POLLUTION PREVENTION, OIL INDUSTRY, EXPLORATION, PRODUCTION, OIL TRANSPORT, REFINING
0989 " HYDROCARBONS , PETROLEUM PRODUCTS, FATE, LEGISLATION, MARINE ENVIRONMENT
1004 " ENVIRONMENTAL EFFECTS, OIL INDUSTRY, GUIDELINES, REGULATIONS, STATISTICS
1080 " WASTEWATER TREATMENT, REFINERIES, STATISTICS
1106 " ENVIRONMENTAL EFFECTS, CRANKCASE OIL, WASTE OIL, DISPOSAL, HEALTH HAZARDS, RECLAMATION, RECYCLING, US, LEGISLATION, STATE GOVERNMENTS
0714 EVAPORATION, CHEMICAL ANALYSIS, PHYSICAL ASPECTS, PETROLEUM PRODUCTS, TOXICITY
0968 " CONCENTRATIONS, BEHAVIOR, OIL SLICKS, HYDROCARBONS
0970 " OIL SLICKS, FATE, MODELS
0988 " CRUDE OIL, COLD CLIMATES, CHROMATOGRAPHY, BIODEGRADATION, AROMATIC HYDROCARBONS, WSF, WSF, CRUDE OIL
0828 EXPLORATION, EUROPE, POLLUTION PREVENTION, OIL INDUSTRY, PRODUCTION, OIL TRANSPORT, REFINING
0996 " DRILLING, BIOLOGICAL EFFECTS, BENTHOS, INVERTEBRATES, *DRILLING MUDS
1115 " OIL-GAS LEASING, INFORMATION SYSTEMS, OFFSHORE, REGULATIONS
0944 EXTRACTION, ENVIRONMENTAL EFFECTS, BALTIC SEA, INDUSTRIES, PETROLEUM PRODUCTS, OIL SHALE, PRODUCTION, DISCHARGES, POLLUTION CONTROL
1075 " WASTEWATER TREATMENT, REFINING
0891 FATE, ATLANTIC OCEAN, HYDROCARBONS , PETROLEUM PRODUCTS, SEDIMENTS, MOVEMENT, *NEW YORK BIGHT
0921 " CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BALTIC SEA, OIL SPILLS, WASTEWATERS
0922 " DEVELOPMENT, BEHAVIOR, ANALYTICAL TECHNIQUES,ENVIRONMENTAL EFFECTS, MONITORING, REFINERIES, WASTEWATERS, POLLUTION CONTROL, HEALTH HAZARDS, *PROCEEDINGS
0923 " EKOFISK BLOWOUT, DRIFT, DISTRIBUTION, BIOLOGICAL EFFECTS, BIODEGRADATION, HYDROCARBONS , NORTH SEA
0929 " BIOLOGICAL EFFECTS, ANALYTICAL TECHNIQUES, SOURCES, FRESHWATER, MARINE ENVIRONMENT, *PROCEEDINGS
0934 " ENVIRONMENTAL EFFECTS, CRUDE OIL, CHRONIC EFFECTS, BACTERIA, ARCTIC, SOIL, FUNGI, PLANTS, *TUNDRA
0935 " CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, SOIL, PHYSICAL EFFECTS, FUNGI, PLANTS, *TUNDRA
0942 " ENVIRONMENTAL EFFECTS, CONTAMINATION, WASTEWATERS, NEW YORK, *NEW YORK BIGHT
0946 " EKOFISK BLOWOUT, BIOLOGICAL EFFECTS, INTERNATIONAL AGREEMENTS, NORTH SEA
0947 " ENVIRONMENTAL EFFECTS, COST ANALYSIS, SOURCES, POLLUTION CONTROL, MODELS, LEGISLATION, RESOURCE MANAGEMENT
0955 " BIODEGRADATION, AROMATIC HYDROCARBONS, MICROORGANISMS, METABOLISM, *PSEUDOMONAS PXY, *BEIJERINCKIA
0967 " ARGO MERCHANT SPILL, ANALYTICAL TECHNIQUES, CHROMATOGRAHY, SEDIMENTS, TAR
0970 " EVAPORATION, OIL SLICKS, MODELS
0971 " CRANKCASE OIL, PAH, SEDIMENTS, *STORMWATER RUNOFF
0973 " CARCINOGENS, PAH, *VOLITILIZATION
0975 " BIODEGRADATION, BERMUDA, TAR, WEATHERING, OIL SPILLS, TROPICAL REGIONS
0976 " AROMATIC HYDROCARBONS, WASTE OIL, TAR, PHYSICAL ASPECTS, MEDITERRANEAN SEA
0989 " EUROPE, HYDROCARBONS , PETROLEUM PRODUCTS, LEGISLATION, MARINE ENVIRONMENT
0991 " ENVIRONMENTAL EFFECTS, BEHAVIOR, STATISTICS, MARINE ENVIRONMENT
0994 " CRUDE OIL, ALASKA , FUEL OIL, SOIL, BIODEGRATION, SUBARCTIC REGIONS
0999 " DISTRIBUTION, SOURCES, REFINERIES, WASTEWATERS, HYDROCARBONS , *PERSISTENCE
1018 " ENVIRONMENTAL EFFECTS, COASTAL ZONE MANAGEMENT, SOURCES, FISHERIES
R079 " DISTRIBUTION, BERMUDA, HYDROCARBONS , SEDIMENTS, TAR, MODELS
R080 " CHEMICAL ANALYSIS, HYDROCARBONS , SEAWATER, SOLUBILITY
1069 FILTRATION, EMULSIONS, WASTEWATER TREATMENT, OIL-WATER SEPARATION, OXIDATION, PATENT
1090 " EMULSIONS, WASTEWATER TREATMENT, COMBUSTION, PATENT
1097 " WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT
1098 " WASTEWATER TREATMENT, PATENT
1100 " OIL-WATER SEPARATION, SORBENTS, PATENT
0690 FISH, CONTAMINATION, ANALYTICAL TECHNIQUES, MONITORING, UPTAKE, TOXICITY, *BIOPSY
0693 " BIOINDICATORS, HYDROCARBONS , MONITORING, METABOLISM, *TAUTOGOLABRUS ADSPERSUS, *ARYL HYDROCARBON HYDROXYLASE
0725 " CONCENTRATIONS, ANALYTICAL TECHNIQUES, SAMPLING, HYDROCARBONS , OFFSHORE, GULF OF MEXICO, *BUCCANEER OILFIELD, *ALKANES
0844 " BERING SEA, HYDROCARBONS , UPTAKE, TOXICITY, METABOLISM, *NAPHTHALENE
0853 " CRUSTACEANS, CRUDE OIL, ACUTE EFFECTS, HYDROCARBONS , WSF, MORTALITY, TOXICITY, *TEMPERATURE EFFECTS
0854 " CRUDE OIL, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, TOXICITY, MORTALITY, *ONCORHYNCHUS GORBUSCHA, *EUALUS SPP., *PANDALUS GONIURUS
0856 " AROMATIC HYDROCARBONS, UPTAKE, METABOLISM, *SALMO SALAR L.
0863 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, METABOLISM
0864 " CRUSTACEANS, BIOASSAY, HYDROCARBONS , SUBLETHAL EFFECTS
0873 " DEPURATION, CRUDE OIL, AROMATIC HYDROCARBONS, UPTAKE, *ANGUILLA JAPONICA, *SULFUR
0874 " DELAWARE BAY, CRUDE OIL, BIOLOGICAL EFFECTS, PETROLEUM PRODUCTS, SOURCES, TOXICITY, SHELLFISH, *URBAN RUNOFF
0878 " CRUDE OIL, CONTAMINATION, AROMATIC HYDROCARBONS, WSF, TOXICITY, *BIOACCUMULATION

0881 FISH, BIOINDICATORS, BIOASSAY, SUBLETHAL EFFECTS, TOXICITY, WASTEWATERS, REFINERIES
0886 " DEPURATION, AROMATIC HYDROCARBONS, UPTAKE, METABOLISM, *NAPHTHALENE
0898 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, WILDLIFE, HABITATS, OIL TRANSPORT
0909 " CARCINOGENS, BERING SEA, BASELINE STUDIES, ALASKA , HEALTH HAZARDS, OCS, *PATHOLOGY
0913 " BASELINE STUDIES, MARINE ORGANISMS, FOOD WEB, PUGET SOUND, *STRAIGHT OF JUAN DE FUCA
0939 " ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, FRESHWATER, ST. LAWRENCE RIVER, WILDLIFE, PAH, MARSHES, *NEPCO 140 SPILL
0995 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL, OFFSHORE, PLATFORMS, MARINE ENVIRONMENT, MICROORGANISMS, SEDIMENTS
R076 " CRUSTACEANS, BIOLOGICAL EFFECTS, HYDROCARBONS , MOLLUSKS, TOXICITY
0824 FISHERIES, POLLUTION PREVENTION, LAKES , *LAKE MARACAIBO
1006 " DEVELOPMENT, OIL INDUSTRY, RESOURCE MANAGEMENT, OFFSHORE, NORTH SEA, UK
1018 " FATE, ENVIRONMENTAL EFFECTS, COASTAL ZONE MANAGEMENT, SOURCES
1039 " DISPERSANTS, BIOLOGICAL EFFECTS, SPILL RESPONSE, POLLUTION CONTROL, WILDLIFE, UK, *CHRISTOS BITAS SPILL
1081 FLOCCULATION, BIBLIOGRAPHIES, WASTEWATER TREATMENT, REFINERIES, POLLUTION CONTROL, FLOTATION, *COAGULATION
0979 FLORIDA, MODELS, OIL SPILLS, SPILL TRAJECTORIES, PREDICTION, OCS
1099 " EPA, WASTEWATER TREATMENT, HEALTH HAZARDS, RIVERS
1081 FLOTATION, FLOCCULATION, BIBLIOGRAPHIES, WASTEWATER TREATMENT, REFINFRIFS, POLLUTION CONTROL, *COAGULATION
0913 FOOD WEB, FISH, BASELINE STUDIES, MARINE ORGANISMS, PUGET SOUND, *STRAIGHT OF JUAN DE FUCA
0928 FOSSIL FUELS, ENVIRONMENTAL EFFECTS, OIL SHALE, RISK ANALYSIS
1014 " ENVIRONMENTAL EFFECTS, DEVELOPMENT
0699 FRANCE, COASTAL WATERS, REMOTE SENSING, SURVEILLANCE, POLLUTION CONTROL
0766 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SPILL REMOVAL
0768 " DESIGN-ENGINEERING, SHIPS, SPILL CLEANUP, POLLUTION CONTROL, OCEANS
0964 " CHRONIC EFFECTS, BIODEGRADATION, BEACHES, HYDROCARBONS , REFINERIES, WASTEWATERS, RECOVERY
0707 FRESHWATER, DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, PAH, SAMPLING, SEDIMENTS
0716 " DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, GC/MS, HYDROCARBONS , *FLAME IONIZATION, *FLAME PHOTOMETRY
0741 " CONCENTRATIONS, CHEMICAL ANALYSIS, SEDIMENTS, SEAWATER
0838 " CANADA, BENTHOS, OIL SPILLS, TAR SANDS, SLUDGE , MORTALITY, TOXICITY, INVERTEBRATES, RIVERS
0840 " CONTAMINATION, BIOLOGICAL EFFECTS, ZOOPLANKTON, MICROORGANISMS
0866 " CRUDE OIL, BIOLOGICAL EFFECTS, ARCTIC, PHYTOPLANKTON, LAKES
0929 " FATE, BIOLOGICAL EFFECTS, ANALYTICAL TECHNIQUES, SOURCES, MARINE ENVIRONMENT, *PROCEEDINGS
0939 " FISH, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, ST. LAWRENCE RIVER, WILDLIFE, PAH, MARSHES, *NEPCO 140 SPILL
0943 " ENVIRONMENTAL EFFECTS, CANADA
0949 " CRUDE OIL, BIODEGRADATION, ARCTIC, FERTILIZATION, *TUNDRA
0958 " BIODEGRADATION, BACTERIA, HYDROCARBONS , RIVERS, *ARTHROBACTER SP.
R074 " DEPURATION, CHEMICAL ANALYSIS, BIOASSAY, FUEL OIL, WSF, TOXICITY, UPTAKE
0814 FUEL OIL, DISPERSANTS, CONTINGENCY PLANNING, BEACH CLEANUP, SPILL RESPONSE, POLLUTION PREVENTION, TANKERS
0842 " BIRDS, BIOLOGICAL EFFECTS, MORTALITY, CHONIC EFFECTS, REPRODUCTION, *LARUS MARINUS
0849 " CRUDE OIL, MARSHES, SUBLETHAL EFFECTS, MODELS, SAMPLING
0857 " CRUSTACEANS, SUBLETHAL EFFECTS, WSF, GROWTH, REPRODUCTION
0889 " BIRDS, BIOLOGICAL EFFECTS, MORTALITY, TOXICITY, REPRODUCTION
0924 " CHRONIC EFFECTS, BIOLOGICAL EFFECTS, RECOVERY, TOXICITY, MARSHES, SEDIMENTS, MASSACHUSETTS, *FUNDULUS
0960 " BIODEGRADATION, BALTIC SEA, BACTERIA, SAMPLING, HYDROCARBONS , MICROORGANISMS, FUNGI, SEDIMENTS
0994 " FATE, CRUDE OIL, ALASKA , SOIL, BIODEGRATION, SUBARCTIC REGIONS
1033 " COLD CLIMATES, CANADA, OIL SPILLS, TANKERS, ICE, *KURDISTAN SPILL, *NOVA SCOTIA
1056 " ENVIRONMENTAL EFFECTS, OIL SPILLS, SPILL RESPONSE, OIL TERMINALS, SCOTLAND, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1060 " ENVIRONMENTAL EFFECTS, COASTS, BIRDS, OIL TERMINALS, TANKERS, OIL SPILLS, MORTALITY, WILDLIFE, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1062 " BIOLOGICAL EFFECTS, OIL TERMINALS, TANKERS, OIL-WATER SEPARATION, SURVEILLANCE, OIL SPILLS, SCOTLAND, *SULLOM VOE TERMINAL
R074 " FRESHWATER, DEPURATION, CHEMICAL ANALYSIS, BIOASSAY, WSF, TOXICITY, UPTAKE
R075 " BIOASSAY, BACTERIA, ANIMALS, MUTAGENS, TOXICITY, YEASTS
R084 " EQUIPMENT, WASTEWATER TREATMENT, POLLUTION PREVENTION
0867 FUNGI, CRUDE OIL, BIOLOGICAL EFFECTS, ALASKA , *TUNDRA
0880 " CRUDE OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, BACTERIA, ALASKA , SOIL, YEASTS, TOXICITY, SUBARCTIC REGIONS
0934 " FATE, ENVIRONMENTAL EFFECTS, CRUDE OIL, CHRONIC EFFECTS, BACTERIA, ARCTIC, SOIL, PLANTS, *TUNDRA

0935 FUNGI, FATE, CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, SOIL, PHYSICAL EFFECTS, PLANTS, *TUNDRA
0953 " CRUDE OIL, CANADA, BIODEGRADATION, SOILS, HYDROCARBONS , *N-ALKANES
0960 " FUEL OIL, BIODEGRADATION, BALTIC SEA, BACTERIA, SAMPLING, HYDROCARBONS , MICROORGANISMS, SEDIMENTS
0961 " CONCENTRATIONS, BIODEGRADATION, HYDROCARBONS , PETROLEUM PRODUCTS, GROWTH, TAR, *FUSARIUM
0851 GASOLINE, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, ARCTIC, SEDIMENTS, MICROORGANISMS, LAKES
1069 " ECONOMICS, COST ANALYSIS, OIL TRANSFER, POLLUTION PREVENTION, REGULATIONS, GUIDELINES
0716 GC/MS, FRESHWATER, DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, HYDROCARBONS , *FLAME IONIZATION, *FLAME PHOTOMETRY
0721 " CRUDE OIL, ANALYTICAL TECHNIQUES
0813 GEORGES BANK, DEVELOPMENT, COASTAL ZONE MANAGEMENT, OFFSHORE, MASSACHUSETTS
1026 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, SOCIOECONOMIC EFFECTS, *NEW ENGLAND
0815 GOVERNMENT AGENCIES, CONTINGENCY PLANNING, CANADA, SPILL COOPERATIVES, OIL INDUSTRY
0816 " CONTINGENCY PLANNING, INTERNATIONAL CONVENTIONS, OIL INDUSTRY, IMCO, *UNEP
0919 " CONTAMINATION, CANADA, BIRDS, BIOLOGICAL EFFECTS, RESOURCE MANAGEMENT
1003 " DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, REGULATIONS, *US FISH & WILDLIFE SERVICE
0703 GREAT LAKES, DETECTION, REMOTE SENSING, MONITORING, MOVEMENT, *LANDSAT, *ERTS
0819 GREENLAND, DENMARK, CANADA, INTERNATIONAL AGREEMENTS, POLLUTION PREVENTION, OFFSHORE, SPILL CLEANUP
0977 " MODELS, SPILL TRAJECTORIES, PREDICTIONS, MOVEMENT, *DAVIS STRAIT
0998 " DRILLING, DRIFT, ICE, OFFSHORE, SAFETY, OIL SPILLS, MODELS, *DAVIS STRAIT
0966 GROUNDWATER, BIODEGRADATION, SOIL, MICROORGANISMS
0978 " CONTAMINATION, MODELS, MOVEMENT
1012 " ENVIRONMENTAL EFFECTS, BIBLIOGRAPHIES, OIL SHALE, RESOURCE MANAGEMENT, WASTEWATERS, REGULATIONS, COLORADO
1073 " CONTAMINATION, POLLUTION CONTROL, SOURCES, PETROLEUM PRODUCTS, STORAGE, PIPELINES, REGULATIONS
0795 GROWTH, ENVIRONMENTAL EFFECTS, CRUDE OIL, BURNING, ALASKA , PLANTS, SOIL, RECOVERY
0850 " CRUDE OIL, CHRONIC EFFECTS, BIRDS, REPRODUCTION
0857 " FUEL OIL, CRUSTACEANS, SUBLETHAL EFFECTS, WSF, REPRODUCTION
0882 " BIRDS, TOXICITY, SUBLETHAL EFFECTS, MORTALITY, *ANAS PLATYRHYNCHOS
0884 " DISPERSANTS, CRUSTACEANS, TOXICITY, MORTALITY, *IDOTEA BALTICA
0961 " FUNGI, CONCENTRATIONS, BIODEGRADATION, HYDROCARBONS , PETROLEUM PRODUCTS, TAR, *FUSARIUM
0817 GUIDELINES, EPA, CONTINGENCY PLANNING, SPILL RESPONSE, OIL INDUSTRY, *INLAND SPILLS
0834 " CARCINOGENS, HEALTH HAZARDS, MARINE ENVIRONMENT
1004 " EUROPE, ENVIRONMENTAL EFFECTS, OIL INDUSTRY, REGULATIONS, STATISTICS
1044 " TANKERS, SHIPS, SAFETY, REGULATIONS, USCG
1069 " GASOLINE, ECONOMICS, COST ANALYSIS, OIL TRANSFER, POLLUTION PREVENTION, REGULATIONS
1086 " COST ANALYSIS, REFINERIES, WASTEWATERS, PETROLEUM PRODUCTS, OIL-WATER SEPARATION, POLLUTION PREVENTION
0897 GULF OF ALASKA, BASELINE STUDIES, ANALYTICAL TECHNIQUES, TRANS-ALASKA PIPELINE, OIL TRANSPORT, HYDROCARBONS
1019 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, ONSHORE IMPACTS, OREGON, WASHINGTON
0725 GULF OF MEXICO, FISH, CONCENTRATIONS, ANALYTICAL TECHNIQUES, SAMPLING, HYDROCARBONS , OFFSHORE, *BUCCANEER OILFIELD, *ALKANES
0726 " CONCENTRATIONS, BIOGENIC HYDROCARBONS, SAMPLING, OIL DISCHARGES, PLANKTON, OFFSHORE, *BUCCANEER OILFIELD, *ALKANES
0727 " CONCENTRATIONS, SAMPLING, OIL DISCHARGES, HYDROCARBONS , OFFSHORE, PLATFORMS, *BUCCANEER OILFIELD, *ALKANES
0728 " BIOGENIC HYDROCARBONS, SAMPLING, OIL DISCHARGES, SEDIMENTS, OFFSHORE, *BUCCANEER OILFIELD, *ALKANES
0825 " DRILLING, DEVELOPMENT, CORAL REEFS, CONSERVATION, OIL-GAS LEASING, OFFSHORE, SEDIMENTATION, NOAA, *MARINE SANCTUARY
1001 " ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, DEEPWATER PORTS, TANKERS, OFFSHORE, LOUISIANA
1008 " DRILLING, CHRONIC EFFECTS, BLM, OCS, PRODUCTION, PLATFORMS, LOUISIANA
1021 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, ONSHORE IMPACTS, WETLANDS
0898 HABITATS, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OCS, OIL-GAS LEASING, OFFSHORE, WILDLIFE, OIL TRANSPORT
R083 " DRILLING, DISTRIBUTION, DEVELOPMENT, ANIMALS, ONSHORE IMPACTS, *ELK
0940 HARBORS, CONTAMINATION, BIBLIOGRAPHIES, RISK ANALYSIS, LITERATURE REVIEW
0732 HEALTH HAZARDS, CHEMICAL ANALYSIS, CARCINOGENS, PAH, MUTAGENS, METABOLISM
0834 " GUIDELINES, CARCINOGENS, MARINE ENVIRONMENT
0868 " BIODEGRADATION, MICROORGANISMS, POLLUTION CONTROL
0909 " FISH, CARCINOGENS, BERING SEA, BASELINE STUDIES, ALASKA , OCS, *PATHOLOGY

0922 HEALTH HAZARDS, FATE, DEVELOPMENT, BEHAVIOR, ANALYTICAL TECHNIQUES,ENVIRONMENTAL
EFFECTS, MONITORING, REFINERIES, WASTEWATERS, POLLUTION CONTROL, *PROCEEDINGS
1099 " FLORIDA, EPA, WASTEWATER TREATMENT, RIVERS
1108 " EUROPE, ENVIRONMENTAL EFFECTS, CRANKCASE OIL, WASTE OIL, DISPOSAL, RECLAMATION,
RECYCLING, US, LEGISLATION, STATE GOVERNMENTS
1116 " OIL INDUSTRY, SAFETY, *ACCIDENTS
0682 HYDROCARBONS , DETECTION, DESIGN-ENGINEERING, BACTERIA, SHIPS, POLLUTION CONTROL,
*ENZYME ELECTRODE
0685 " DETECTION, ANALYTICAL TECHNIQUES, REFINERIES, *PROCEEDINGS
0693 " FISH, BIOINDICATORS, MONITORING, METABOLISM, *TAUTOGOLABRUS ADSPERSUS, *ARYL
HYDROCARBON HYDROXYLASE
0696 " DETECTION, REMOTE SENSING, OIL SLICKS, MONITORING, *PROCEEDINGS
0705 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, SOURCES
0708 " ENVIRONMENTAL EFFECTS, DETECTION, CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS,
SEDIMENTS
0711 " CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, NOAA
0712 " DISTRIBUTION, BIOGENIC HYDROCARBONS, BASELINE STUDIES, ALASKA , NATURAL SEEPS,
MONITORING, OCS
0716 " GC/MS, FRESHWATER, DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, *FLAME
IONIZATION, *FLAME PHOTOMETRY
0717 " DISPERSION, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION
0718 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIODEGRADATION, SPECTROSCOPY, WEATHERING,
*WATER SLUICES
0719 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, TAR, SOURCE IDENTIFICATION
0720 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOIL
0725 " GULF OF MEXICO, FISH, CONCENTRATIONS, ANALYTICAL TECHNIQUES, SAMPLING, OFFSHORE,
*BUCCANEER OILFIELD, *ALKANES
0727 " GULF OF MEXICO, CONCENTRATIONS, SAMPLING, OIL DISCHARGES, OFFSHORE, PLATFORMS,
*BUCCANEER OILFIELD, *ALKANES
0733 " CONTAMINATION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SEAWATER, PHYTOPLANKTON, USSR
0736 " CONCENTRATIONS, COASTAL WATERS, SAMPLING, OFFSHORE, INDIA
0737 " EQUIPMENT, DESIGN-ENGINEERING, SAMPLING, SEAWATER
0738 " ANALYTICAL TECHNIQUES, *MASS FRAGMENTGRAPHY
0740 " CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, PETROLEUM PRODUCTS, SAMPLING,
SOLUBILITY, *PARTITION COEFFICIENTS
0743 " DETECTION, CHROMATOGRAPHY, ANIMALS, ANALYTICAL TECHNIQUES, PETROLEUM PRODUCTS,
*RUMINANTS
0746 " DISTRIBUTION, CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS, SOURCE IDENTIFICATION,
*ALKANES
0836 " BENTHOS, ALASKA , MARINE ORGANISMS, SEDIMENTS, UPTAKE, OCS, *DEPOSIT-FEEDERS
0839 " BIOMASS, BIOLOGICAL EFFECTS, PHYTOPLANKTON, MARINE ENVIRONMENT, *GUFEX
0844 " FISH, BERING SEA, UPTAKE, TOXICITY, METABOLISM, *NAPHTHALENE
0845 " CHRONIC EFFECTS, BIRDS, ANALYTICAL TECHNIQUES, ACUTE EFFECTS, TOXICITY, MORTALITY,
WILDLIFE
0848 " ECOSYSTEMS, COASTS, CHRONIC EFFECTS, *WETLANDS
0853 " FISH, CRUSTACEANS, CRUDE OIL, ACUTE EFFECTS, WSF, MORTALITY, TOXICITY,
*TEMPERATURE EFFECTS
0858 " DEPURATION, BIOLOGICAL EFFECTS, MARINE ORGANISMS, UPTAKE, MOLLUSKS, *BIVALVES
0859 " BIOLOGICAL EFFECTS, BIOINDICATORS, UPTAKE, METABOLISM, MARINE ORGANISMS, MOLLUSKS,
*DETOXIFICATION MECHANISMS
0862 " PLANTS, SUBLETHAL EFFECTS, *PHOTOSYNTHESIS
0864 " FISH, CRUSTACEANS, BIOASSAY, SUBLETHAL EFFECTS
0871 " DEPURATION, BIOLOGICAL EFFECTS, UPTAKE, MOLLUSKS, *TAPES SEMIDECUSSATA
0877 " ALASKA , ACUTE EFFECTS, WSF, MARINE ORGANISMS, TOXICITY, SUBLETHAL EFFECTS,
RECOVERY
0890 " CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, MICROORGANISMS, *CHLOROPHYLL
0891 " FATE, ATLANTIC OCEAN, PETROLEUM PRODUCTS, SEDIMENTS, MOVEMENT, *NEW YORK BIGHT
0897 " GULF OF ALASKA, BASELINE STUDIES, ANALYTICAL TECHNIQUES, TRANS-ALASKA PIPELINE,
OIL TRANSPORT
0908 " CHROMATOGRAPHY, BASELINE STUDIES, OIL TRANSPORT, PORTS , PUGET SOUND
0912 " DISTRIBUTION, BIOGENIC HYDROCARBONS, BEAUFORT SEA, BASELINE STUDIES, ALASKA ,
SEDIMENTATION, OCS
0923 " FATE, EKOFISK BLOWOUT, DRIFT, DISTRIBUTION, BIOLOGICAL EFFECTS, BIODEGRADATION,
NORTH SEA
0950 " BIODEGRADATION, BEHAVIOR, BACTERIA
0953 " FUNGI, CRUDE OIL, CANADA, BIODEGRADATION, SOILS, *N-ALKANES
0958 " FRESHWATER, BIODEGRADATION, BACTERIA, RIVERS, *ARTHROBACTER SP.
0960 " FUNGI, FUEL OIL, BIODEGRADATION, BALTIC SEA, BACTERIA, SAMPLING, MICROORGANISMS,
SEDIMENTS
0961 " GROWTH, FUNGI, CONCENTRATIONS, BIODEGRADATION, PETROLEUM PRODUCTS, TAR, *FUSARIUM
0963 " BIODEGRADATION, MICROORGANISMS, METABOLISM
0964 " FRANCE, CHRONIC EFFECTS, BIODEGRADATION, BEACHES, REFINERIES, WASTEWATERS, RECOVERY
0965 " COLD CLIMATES, BIODEGRADATION, BACTERIA, SEDIMENTS
0968 " EVAPORATION, CONCENTRATIONS, BEHAVIOR, OIL SLICKS

0974 HYDROCARBONS , CONCENTRATIONS, MARINE ENVIRONMENT, PHYSICAL EFFECTS, SEA SURFACE, SAMPLING, SOURCES, *ATMOSPHERIC INPUTS
0989 " FATE, EUROPE, PETROLEUM PRODUCTS, LEGISLATION, MARINE ENVIRONMENT
0993 " CONCENTRATIONS, BAYS, SAMPLING, CHEMICAL ANALYSIS, RIVERS, SEDIMENTS, NARRAGANSETT BAY
0999 " FATE, DISTRIBUTION, SOURCES, REFINERIES, WASTEWATERS, *PERSISTENCE
1023 " ENVIRONMENTAL EFFECTS, DRILLING, OCS, WASTEWATERS, *BATEA, *NSPS
1058 " CRUDE OIL, PETROLEUM PRODUCTS, OIL TRANSFER, OIL TERMINALS, LEAKAGE, POLLUTION CONTROL, TANKERS
1082 " WASTEWATER TREATMENT, POLLUTION CONTROL, SORBENTS, *HYDROPHOBIC MATERIAL
1093 " WASTEWATER TREATMENT, PATENT
1105 " EMULSIONS, OIL-WATER SEPARATION, PATENT
1107 " CRANKCASE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, WASTE OIL, LUBRICATING OIL, RECLAMATION, US
R073 " CHEMICAL ANALYSIS, BENTHOS, SEAWATER, SEDIMENT, *TRANSPORT
R076 " FISH, CRUSTACEANS, BIOLOGICAL EFFECTS, MOLLUSKS, TOXICITY
R077 " CONTAMINATION, COLD CLIMATES, BASELINE STUDIES, ARCTIC
R079 " FATE, DISTRIBUTION, BERMUDA, SEDIMENTS, TAR, MODELS
R080 " FATE, CHEMICAL ANALYSIS, SEAWATER, SOLUBILITY
R082 " DISTRIBUTION, ALASKA , MODELS, MOVEMENT, OIL-GAS LEASING
0683 ICE, DETECTION, COLD CLIMATES, OIL SPILLS
0770 " COLD CLIMATES, ALASKA , SPILL REMOVAL, SPILL CLEANUP, SORBENTS, OIL TANKS
0779 " BUZZARDS BAY, BOUCHARD 65 SPILL, SPILL CLEANUP, SPILL REMOVAL, SPREADING, WEATHERING
0894 " ENVIRONMENTAL EFFECTS, COLD CLIMATES, CANADA, OIL SPILLS
0896 " EIS, DRILLING, COLD CLIMATES, CANADA, BLOWOUTS, OFFSHORE, *LANCASTER SOUND
0998 " GREENLAND, DRILLING, DRIFT, OFFSHORE, SAFETY, OIL SPILLS, MODELS, *DAVIS STRAIT
1033 " FUEL OIL, COLD CLIMATES, CANADA, OIL SPILLS, TANKERS, *KURDISTAN SPILL, *NOVA SCOTIA
0816 IMCO, GOVERNMENT AGENCIES, CONTINGENCY PLANNING, INTERNATIONAL CONVENTIONS, OIL INDUSTRY, *UNEP
0822 " EQUIPMENT, TANKERS, OIL DISCHARGES, REGULATIONS, USCG, OIL-WATER SEPARATION
1031 " TANKERS, OIL TRANSPORT, SAFETY, REGULATIONS, LAW ENFORCEMENT, LIABILITY, INTERNATIONAL AGREEMENTS
1034 " TANKERS, SHIPS, INTERNATIONAL CONVENTIONS, SEGREGATED BALLAST, POLLUTION PREVENTION
1035 " CRUDE OIL WASHING, TANKERS, SAFETY, POLLUTION PREVENTION, SEGREGATED BALLAST, INTERNATIONAL CONVENTIONS, STATISTICS
1051 " CRUDE OIL WASHING, TANKERS, POLLUTION PREVENTION
1068 " INTERNATIONAL CONVENTION, POLLUTION CONTROL, SAFETY, TANKERS, LIABILITY, *LAW OF THE SEA
0736 INDIA, HYDROCARBONS , CONCENTRATIONS, COASTAL WATERS, SAMPLING, OFFSHORE
0944 INDUSTRIES, EXTRACTION, ENVIRONMENTAL EFFECTS, BALTIC SEA, PETROLEUM PRODUCTS, OIL SHALE, PRODUCTION, DISCHARGES, POLLUTION CONTROL
1079 " WASTEWATER TREATMENT, OIL REMOVAL, *POLYETHYLENIMINE
0747 INFORMATION SYSTEMS, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, OIL SPILLS, MODELS, *PATTERN RECOGNITION
0984 " CANADA, MODELS, STATISTICS, OIL SPILLS, PREDICTIONS
1115 " EXPLORATION, OIL-GAS LEASING, OFFSHORE, REGULATIONS
0818 INSURANCE, EPA, LEGISLATION, SPILL CLEANUP, SPILL REMOVAL, LIABILITY, REGULATIONS, *SUPERFUND
0688 INTERNATIONAL AGREEMENTS, CONTINGENCY PLANNING, MONITORING, OIL SPILLS, RESOURCE MANAGEMENT, *IGOSS
0819 " GREENLAND, DENMARK, CANADA, POLLUTION PREVENTION, OFFSHORE, SPILL CLEANUP
0830 " COMPENSATION, SOURCES, POLLUTION PREVENTION, REGULATIONS, JAPAN
0946 " FATE, EKOFISK BLOWOUT, BIOLOGICAL EFFECTS, NORTH SEA
1027 " DEVELOPMENT, OCS, OFFSHORE, PRODUCTION, TANKERS, OIL TRANSPORT, REFINING, *CHINA SEA, *MARINE REGIONALISM
1031 " IMCO, TANKERS, OIL TRANSPORT, SAFETY, REGULATIONS, LAW ENFORCEMENT, LIABILITY
1032 " OIL DISCHARGES, MORTALITY, MARINE ORGANISMS, REGULATIONS, SPILL RESPONSE
1041 " ENGLISH CHANNEL, TANKERS, OIL TRANSPORT, SAFETY, MONITORING, REGULATIONS
1064 " OIL TRANSPORT, TANKERS, SHIPS, LIABILITY, LEGISLATION, REGULATIONS, INTERNATIONAL CONVENTIONS, *LAW OF THE SEA
0816 INTERNATIONAL CONVENTIONS, IMCO, GOVERNMENT AGENCIES, CONTINGENCY PLANNING, OIL INDUSTRY, *UNEP
0821 " REGULATIONS, USCG, TANKERS, SAFETY
0920 " DEVELOPMENT, LEGISLATION, LIABILITY, CONPENSATION, NORTH SEA, UK, NORWAY, OFFSHORE
1034 " IMCO, TANKERS, SHIPS, SEGREGATED BALLAST, POLLUTION PREVENTION
1035 " IMCO, CRUDE OIL WASHING, TANKERS, SAFETY, POLLUTION PREVENTION, SEGREGATED BALLAST, STATISTICS
1064 " INTERNATIONAL AGREEMENTS, OIL TRANSPORT, TANKERS, SHIPS, LIABILITY, LEGISLATION, REGULATIONS, *LAW OF THE SEA
0841 INTERTIDAL ZONE, BIOLOGICAL EFFECTS, TROPICAL REGIONS
0876 " ENVIRONMENTAL EFFECTS, DISTRIBUTION, BENTHOS, MARINE ORGANISMS, SCOTLAND
0937 " CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, OIL SPILLS, PHYSICAL EFFECTS, *EXPERIMENTAL DESIGN

0838 INVERTEBRATES, FRESHWATER, CANADA, BENTHOS, OIL SPILLS, TAR SANDS, SLUDGE , MORTALITY, TOXICITY, RIVERS
0932 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, OIL SPILLS, PLANTS, REMOTE SENSING, *MANGROVE FORESTS
0996 " EXPLORATION, DRILLING, BIOLOGICAL EFFECTS, BENTHOS, *DRILLING MUDS
0997 " DRILLING, BIOLOGICAL EFFECTS, BENTHOS, *BARITE, *DRILLING MUDS
1038 IRELAND, ENVIRONMENTAL EFFECTS, BAYS, OIL SPILLS, TANKERS, SPREADING, SPILL CLEANUP, *BETELGEUSE SPILL
1070 " OIL SPILLS, STATISTICS, UK
1114 ISRAEL, RESOURCE MANAGEMENT, OIL SPILLS, RED SEA
0830 JAPAN, INTERNATIONAL AGREEMENTS, COMPENSATION, SOURCES, POLLUTION PREVENTION, REGULATIONS
0941 " CONTAMINATION, COASTAL ZONE MANAGEMENT, COASTAL WATERS, SHIPS, TANKERS, OIL DISCHARGES
1022 KUWAIT, DEVELOPMENT, CRUDE OIL, SOCIOECONOMIC EFFECTS, OIL SPILLS, SOLID WASTES
0723 LAKES , DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, PAH, *AIR-WATER INTERFACE, LOUISIANA
0824 " FISHERIES, POLLUTION PREVENTION, *LAKE MARACAIBO
0851 " GASOLINE, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, ARCTIC, SEDIMENTS, MICROORGANISMS
0852 " CRUDE OIL, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, MICROORGANISMS, SEDIMENTS, TOXICITY
0866 " FRESHWATER, CRUDE OIL, BIOLOGICAL EFFECTS, ARCTIC, PHYTOPLANKTON
0948 LAND FARMING, BIODEGRADATION, MICROORGANISMS, *FERTILIZATION
1088 " SLUDGE, DISPOSAL, REFINERIES, PETROCHEMICALS
0789 LAND SPILLS, CONTAMINATION, SPILL CLEANUP, WASTE OIL TREATMENT, PATENT
0969 " BIODEGRADATION, SOIL, TOXICITY, PLANTS
0745 LAW ENFORCEMENT, EPA, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, WEATHERING
0752 " CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, LIABILITY
1031 " INTERNATIONAL AGREEMENTS, IMCO, TANKERS, OIL TRANSPORT, SAFETY, REGULATIONS, LIABILITY
1053 LEAKAGE, EQUIPMENT, DETECTION, DESIGN-ENGINEERING, PIPELINES, REFINERIES, MONITORING, PATENT
1054 " EQUIPMENT, DETECTION, PIPELINES, MONITORING, NORTH SEA, UK
1055 " EQUIPMENT, DETECTION, DESIGN-ENGINEERING, PIPELINES, PATENT
1058 " HYDROCARBONS , CRUDE OIL, PETROLEUM PRODUCTS, OIL TRANSFER, OIL TERMINALS, POLLUTION CONTROL, TANKERS
0818 LEGISLATION, INSURANCE, EPA, SPILL CLEANUP, SPILL REMOVAL, LIABILITY, REGULATIONS, *SUPERFUND
0820 " MARINE ENVIRONMENT, REGULATIONS, POLLUTION PREVENTION
0920 " INTERNATIONAL CONVENTIONS, DEVELOPMENT, LIABILITY, CONPENSATION, NORTH SEA, UK, NORWAY, OFFSHORE
0931 " EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, BEHAVIOR, OIL TRANSPORT, SPILL RESPONSE, POLLUTION PREVENTION, POLLUTION CONTROL, *CONFERENCE
0947 " FATE, ENVIRONMENTAL EFFECTS, COST ANALYSIS, SOURCES, POLLUTION CONTROL, MODELS, RESOURCE MANAGEMENT
0989 " HYDROCARBONS , FATE, EUROPE, PETROLEUM PRODUCTS, MARINE ENVIRONMENT
1002 " COMPENSATION, REGULATIONS, OIL INDUSTRY, SOLID WASTES, NORWAY
1005 " DEVELOPMENT, COASTAL ZONE MANAGEMENT, OIL-GAS LEASING, REGULATIONS, RESOURCE MANAGEMENT, OCS, *PUBLIC PARTICIPATION
1064 " INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, OIL TRANSPORT, TANKERS, SHIPS, LIABILITY, REGULATIONS, *LAW OF THE SEA
1067 " COMPENSATION, COASTAL WATERS, SPILL CLEANUP, LIABILITY
1108 " HEALTH HAZARDS, EUROPE, ENVIRONMENTAL EFFECTS, CRANKCASE OIL, WASTE OIL, DISPOSAL, RECLAMATION, RECYCLING, US, STATE GOVERNMENTS
1111 " EPA, OIL INDUSTRY, SOLID WASTES, REGULATIONS
0752 LIABILITY, LAW ENFORCEMENT, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION
0818 " LEGISLATION, INSURANCE, EPA, SPILL CLEANUP, SPILL REMOVAL, REGULATIONS, *SUPERFUND
0920 " LEGISLATION, INTERNATIONAL CONVENTIONS, DEVELOPMENT, CONPENSATION, NORTH SEA, UK, NORWAY, OFFSHORE
1010 " ENVIRONMENTAL EFFECTS, DRILLING, DEVELOPMENT, CANADA, ARCTIC, WILDLIFE, RISK ANALYSIS, *LANCASTER SOUND
1031 " LAW ENFORCEMENT, INTERNATIONAL AGREEMENTS, IMCO, TANKERS, OIL TRANSPORT, SAFETY, REGULATIONS
1064 " LEGISLATION, INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, OIL TRANSPORT, TANKERS, SHIPS, REGULATIONS, *LAW OF THE SEA
1067 " LEGISLATION, COMPENSATION, COASTAL WATERS, SPILL CLEANUP
1068 " IMCO, INTERNATIONAL CONVENTION, POLLUTION CONTROL, SAFETY, TANKERS, *LAW OF THE SEA
0723 LOUISIANA, LAKES , DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, PAH, *AIR-WATER INTERFACE
0903 " ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, TEXAS
0904 " ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, TEXAS
0905 " ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE, TEXAS
0906 " ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, STORAGE

1001 LOUISIANA, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, DEEPWATER PORTS, TANKERS, OFFSHORE
1008 " GULF OF MEXICO, DRILLING, CHRONIC EFFECTS, BLM, OCS, PRODUCTION, PLATFORMS
1009 " DRILLING, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, OFFSHORE, PRODUCTION, PHYSICAL EFFECTS, *OFFSHORE ECOLOGY INVESTIGATION
1030 " DEVELOPMENT, BASELINE STUDIES, OIL INDUSTRY, RESOURCE MANAGEMENT
1078 LUBRICATING OIL, WASTE OIL TREATMENT, RECLAMATION, PATENT
1107 " HYDROCARBONS , CRANKCASE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, WASTE OIL, RECLAMATION, US
1109 " RECLAMATION, PATENT, *FE-CONTAMINATED OILS
1110 " ENVIRONMENTAL EFFECTS, RECLAMATION, REFINING, RECYCLING, WASTE OIL
0820 MARINE ENVIRONMENT, LEGISLATION, REGULATIONS, POLLUTION PREVENTION
0834 " HEALTH HAZARDS, GUIDELINES, CARCINOGENS
0839 " HYDROCARBONS , BIOMASS, BIOLOGICAL EFFECTS, PHYTOPLANKTON, *GUFEX
0870 " CRUDE OIL, BIOLOGICAL EFFECTS, ALGAE, WSF, *DUNALLIELA TERTIOLECTA
0917 " BEHAVIOR, BASELINE STUDIES, ATLANTIC OCEAN, MODELS, PREDICTIONS, OCS, PHYSICAL ASPECTS
0929 " FRESHWATER, FATE, BIOLOGICAL EFFECTS, ANALYTICAL TECHNIQUES, SOURCES, *PROCEEDINGS
0952 " BIODEGRADATION, MICROORGANISMS, OIL SPILLS
0974 " HYDROCARBONS , CONCENTRATIONS, PHYSICAL EFFECTS, SEA SURFACE, SAMPLING, SOURCES, *ATMOSPHERIC INPUTS
0981 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, BERING SEA, MODELS
0989 " LEGISLATION, HYDROCARBONS , FATE, EUROPE, PETROLEUM PRODUCTS
0991 " FATE, ENVIRONMENTAL EFFECTS, BEHAVIOR, STATISTICS
0995 " FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL, OFFSHORE, PLATFORMS, MICROORGANISMS, SEDIMENTS
1029 " ENVIRONMENTAL EFFECTS, WASTEWATERS, REFINING
0847 MARINE MAMMALS, ENVIRONMENTAL EFFECTS, CANADA, BEHAVIOR, OIL SPILLS, MORTALITY, *BRITISH COLUMBIA, *ENHYDRA LUTRIS
0938 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL, PETROLEUM PRODUCTS, OIL-GAS LEASING, MARINE ORGANISMS
1024 " ECOSYSTEMS, ARCTIC, RESOURCE MANAGEMENT, MODELS
0836 MARINE ORGANISMS, HYDROCARBONS , BENTHOS, ALASKA , SEDIMENTS, UPTAKE, OCS, *DEPOSIT-FEEDERS
0843 " BIOLOGICAL EFFECTS, BEHAVIOR, TOXICITY
0858 " HYDROCARBONS , DEPURATION, BIOLOGICAL EFFECTS, UPTAKE, MOLLUSKS, *BIVALVES
0859 " HYDROCARBONS , BIOLOGICAL EFFECTS, BIOINDICATORS, UPTAKE, METABOLISM, MOLLUSKS, *DETOXIFICATION MECHANISMS
0876 " INTERTIDAL ZONE, ENVIRONMENTAL EFFECTS, DISTRIBUTION, BENTHOS, SCOTLAND
0877 " HYDROCARBONS , ALASKA , ACUTE EFFECTS, WSF, TOXICITY, SUBLETHAL EFFECTS, RECOVERY
0887 " DISPERSANTS, CONCENTRATIONS, TOXICITY, MORTALITY, MOLLUSKS
0913 " FOOD WEB, FISH, BASELINE STUDIES, PUGET SOUND, *STRAIGHT OF JUAN DE FUCA
0938 " MARINE MAMMALS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL, PETROLEUM PRODUCTS, OIL-GAS LEASING
1032 " INTERNATIONAL AGREEMENTS, OIL DISCHARGES, MORTALITY, REGULATIONS, SPILL RESPONSE
0849 MARSHES, FUEL OIL, CRUDE OIL, SUBLETHAL EFFECTS, MODELS, SAMPLING
0924 " FUEL OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, RECOVERY, TOXICITY, SEDIMENTS, MASSACHUSETTS, *FUNDULUS
0939 " FRESHWATER, FISH, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, ST. LAWRENCE RIVER, WILDLIFE, PAH, *NEPCO 140 SPILL
0813 MASSACHUSETTS, GEORGES BANK, DEVELOPMENT, COASTAL ZONE MANAGEMENT, OFFSHORE
0924 " MARSHES, FUEL OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, RECOVERY, TOXICITY, SEDIMENTS, *FUNDULUS
0827 MEDITERRANEAN SEA, EQUIPMENT, DRILLING, BLOWOUT PREVENTION, OFFSHORE, POLLUTION PREVENTION, NORTH SEA
0976 " FATE, AROMATIC HYDROCARBONS, WASTE OIL, TAR, PHYSICAL ASPECTS
1074 " BALLAST , TANKERS, WASTEWATER TREATMENT, OIL REMOVAL
0693 METABOLISM, HYDROCARBONS , FISH, BIOINDICATORS, MONITORING, *TAUTOGOLABRUS ADSPERSUS, *ARYL HYDROCARBON HYDROXYLASE
0732 " HEALTH HAZARDS, CHEMICAL ANALYSIS, CARCINOGENS, PAH, MUTAGENS
0844 " HYDROCARBONS , FISH, BERING SEA, UPTAKE, TOXICITY, *NAPHTHALENE
0856 " FISH, AROMATIC HYDROCARBONS, UPTAKE, *SALMO SALAR L.
0859 " MARINE ORGANISMS, HYDROCARBONS , BIOLOGICAL EFFECTS, BIOINDICATORS, UPTAKE, MOLLUSKS, *DETOXIFICATION MECHANISMS
0863 " FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS
0886 " FISH, DEPURATION, AROMATIC HYDRCARBONS, UPTAKE, *NAPHTHALENE
0955 " FATE, BIODEGRADATION, AROMATIC HYDROCARBONS, MICROORGANISMS, *PSEUDOMONAS PXY, *BEIJERINCKIA
0963 " HYDROCARBONS , BIODEGRADATION, MICROORGANISMS
0715 MICROORGANISMS, CRUDE OIL, ANALYTICAL TECHNIQUES, MUTAGENS, PAH, *SALMONELLA TYPHIMURIUM/MICROSOMAL ACTIVATION
0840 " FRESHWATER, CONTAMINATION, BIOLOGICAL EFFECTS, ZOOPLANKTON
0851 " LAKES , GASOLINE, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, ARCTIC, SEDIMENTS
0852 " LAKES , CRUDE OIL, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, SEDIMENTS, TOXICITY

0868 MICROORGANISMS, HEALTH HAZARDS, BIODEGRADATION, POLLUTION CONTROL
0879 " CRUDE OIL, BIOLOGICAL EFFECTS, ALASKA , OIL SPILLS, *TUNDRA
0890 " HYDROCARBONS , CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, *CHLOROPHYLL
0948 " LAND FARMING, BIODEGRADATION, *FERTILIZATION
0952 " MARINE ENVIRONMENT, BIODEGRADATION, OIL SPILLS
0955 " METABOLISM, FATE, BIODEGRADATION, AROMATIC HYDROCARBONS, *PSEUDOMONAS PXY, *BEIJERINCKIA
0956 " BIODEGRADATION, AROMATIC HYDROCARBONS
0957 " BIODEGRADATION, BACTERIA, ARCTIC, USSR, *MYOBACTERIUM SP.
0960 " HYDROCARBONS , FUNGI, FUEL OIL, BIODEGRADATION, BALTIC SEA, BACTERIA, SAMPLING, SEDIMENTS
0962 " BIODEGRADATION, PATENT
0963 " METABOLISM, HYDROCARBONS , BIODEGRADATION
0966 " GROUNDWATER, BIODEGRADATION, SOIL
0990 " ENVIRONMENTAL EFFECTS, BIODEGRADATION, PETROLEUM PRODUCTS, TOXICITY, SEDIMENTS
0995 " MARINE ENVIRONMENT, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL, OFFSHORE, PLATFORMS, SEDIMENTS
R078 " DISTRIBUTION, BIODEGRADATION, OCEANS
0687 MODELS, DETECTION, OIL SPILLS, MOVEMENT, MONITORING, REMOTE SENSING
0700 " DETECTION, REMOTE SENSING, SEA SURFACE
0747 " INFORMATION SYSTEMS, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, OIL SPILLS, *PATTERN RECOGNITION
0849 " MARSHES, FUEL OIL, CRUDE OIL, SUBLETHAL EFFECTS, SAMPLING
0911 " ENVIRONMENTAL EFFECTS, EIS, ANTARCTICA,BASELINE STUDIES, MONITORING
0917 " MARINE ENVIRONMENT, BEHAVIOR, BASELINE STUDIES, ATLANTIC OCEAN, PREDICTIONS, OCS, PHYSICAL ASPECTS
0947 " LEGISLATION, FATE, ENVIRONMENTAL EFFECTS, COST ANALYSIS, SOURCES, POLLUTION CONTROL, RESOURCE MANAGEMENT
0970 " FATE, EVAPORATION, OIL SLICKS
0977 " GREENLAND, SPILL TRAJECTORIES, PREDICTIONS, MOVEMENT, *DAVIS STRAIT
0978 " GROUNDWATER, CONTAMINATION, MOVEMENT
0979 " FLORIDA, OIL SPILLS, SPILL TRAJECTORIES, PREDICTION, OCS
0980 " SPILL TRAJECTORIES, OIL SLICKS, MOVEMENT, PREDICTIONS
0981 " MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, BERING SEA
0982 " RISK ANALYSIS, SPILL TRAJECTORIES, OCS, USGS
0984 " INFORMATION SYSTEMS, CANADA, STATISTICS, OIL SPILLS, PREDICTIONS
0985 " DISPERSION, OIL SPILLS, *WAVE ACTION
0986 " DRIFT, BEHAVIOR, OIL SPILLS, SPILL TRAJECTORIES, SEA SURFACE, PREDICITIONS
0987 " DRIFT, BEHAVIOR, SPILL TRAJECTORIES, NEW YORK
0998 " ICE, GREENLAND, DRILLING, DRIFT, OFFSHORE, SAFETY, OIL SPILLS, *DAVIS STRAIT
1011 " ENVIRONMENTAL EFFECTS, OIL SHALE, REGULATION, WASTEWATERS, RESOURCE MANAGEMENT, COLORADO
1020 " ENVIRONMENTAL EFFECTS, OFFSHORE, OIL-GAS LEASING, OIL FIELDS, TEXAS
1024 " MARINE MAMMALS, ECOSYSTEMS, ARCTIC, RESOURCE MANAGEMENT
R079 " HYDROCARBONS , FATE, DISTRIBUTION, BERMUDA, SEDIMENTS, TAR
R081 " DISPERSION, SPILL TRAJECTORIES, MOVEMENT, RIVERS
R082 " HYDROCARBONS , DISTRIBUTION, ALASKA , MOVEMENT, OIL-GAS LEASING
0858 MOLLUSKS, MARINE ORGANISMS, HYDROCARBONS , DEPURATION, BIOLOGICAL EFFECTS, UPTAKE, *BIVALVES
0859 " METABOLISM, MARINE ORGANISMS, HYDROCARBONS , BIOLOGICAL EFFECTS, BIOINDICATORS, UPTAKE, *DETOXIFICATION MECHANISMS
0871 " HYDROCARBONS , DEPURATION, BIOLOGICAL EFFECTS, UPTAKE, *TAPES SEMIDECUSSATA
0887 " MARINE ORGANISMS, DISPERSANTS, CONCENTRATIONS, TOXICITY, MORTALITY
R076 " HYDROCARBONS , FISH, CRUSTACEANS, BIOLOGICAL EFFECTS, TOXICITY
0686 MONITORING, DETECTION, CONTAMINATION, BIOLOGICAL EFFECTS, BIOINDICATORS, TOXICITY
0687 " MODELS, DETECTION, OIL SPILLS, MOVEMENT, REMOTE SENSING
0688 " INTERNATIONAL AGREEMENTS, CONTINGENCY PLANNING, OIL SPILLS, RESOURCE MANAGEMENT, *IGOSS
0690 " FISH, CONTAMINATION, ANALYTICAL TECHNIQUES, UPTAKE, TOXICITY, *BIOPSY
0693 " METABOLISM, HYDROCARBONS , FISH, BIOINDICATORS, *TAUTOGOLABRUS ADSPERSUS, *ARYL HYDROCARBON HYDROXYLASE
0695 " DETECTION, REMOTE SENSING, OIL SLICKS, TANKERS, SHIPS, SWEDEN
0696 " HYDROCARBONS , DETECTION, REMOTE SENSING, OIL SLICKS, *PROCEEDINGS
0697 " DETECTION, ANALYTICAL TECHNIQUES, REMOTE SENSING, *AIRBORNE LASER
0698 " DETECTION, ANALYTICAL TECHNIQUES, REMOTE SENSING, SOURCE IDENTIFICATION, *SPECTRAL SIGNATURES
0703 " GREAT LAKES, DETECTION, REMOTE SENSING, MOVEMENT, *LANDSAT, *ERTS
0712 " HYDROCARBONS , DISTRIBUTION, BIOGENIC HYDROCARBONS, BASELINE STUDIES, ALASKA , NATURAL SEEPS, OCS
0735 " CONTAMINATION, ANALYTICAL TECHNIQUES, WASTEWATERS, REFINING, *ENZYME INHIBITION SCREENING
0832 " EPA, CONTAMINATION, CHEMICAL ANALYSIS, OIL SHALE, POLLUTION CONTROL, SAMPLING
0911 " MODELS, ENVIRONMENTAL EFFECTS, EIS, ANTARCTICA,BASELINE STUDIES
0922 " HEALTH HAZARDS, FATE, DEVELOPMENT, BEHAVIOR, ANALYTICAL TECHNIQUES,ENVIRONMENTAL EFFECTS, REFINERIES, WASTEWATERS, POLLUTION CONTROL, *PROCEEDINGS

1017 MONITORING, ENVIRONMENTAL EFFECTS, TRANS-ALASKA PIPELINE, *CONSTRUCTION
1041 " INTERNATIONAL AGREEMENTS, ENGLISH CHANNEL, TANKERS, OIL TRANSPORT, SAFETY, REGULATIONS
1050 " EQUIPMENT, BALLAST , OIL DISCHARGES, TANKERS, SHIPS, OIL SLICKS
1053 " LEAKAGE, EQUIPMENT, DETECTION, DESIGN-ENGINEERING, PIPELINES, REFINERIES, PATENT
1054 " LEAKAGE, EQUIPMENT, DETECTION, PIPELINES, NORTH SEA, UK
0801 MORTALITY, ENVIRONMENTAL EFFECTS, BIRDS, ANIMALS, OIL SPILLS, SPILL CLEANUP, SCOTLAND, *ESSO BERNICIA SPILL
0835 " BIRDS, BIOLOGICAL EFFECTS, OIL SPILLS, OIL TRANSFER, UK, *WALES, *PODICEPS CRISTATUS
0838 " INVERTEBRATES, FRESHWATER, CANADA, BENTHOS, OIL SPILLS, TAR SANDS, SLUDGE , TOXICITY, RIVERS
0842 " FUEL OIL, BIRDS, BIOLOGICAL EFFECTS, CHONIC EFFECTS, REPRODUCTION, *LARUS MARINUS
0845 " HYDROCARBONS , CHRONIC EFFECTS, BIRDS, ANALYTICAL TECHNIQUES, ACUTE EFFECTS, TOXICITY, WILDLIFE
0846 " CRUSTACEANS, BIOLOGICAL EFFECTS, WSF, TOXICITY
0847 " MARINE MAMMALS, ENVIRONMENTAL EFFECTS, CANADA, BEHAVIOR, OIL SPILLS, *BRITISH COLUMBIA, *ENHYDRA LUTRIS
0853 " HYDROCARBONS , FISH, CRUSTACEANS, CRUDE OIL, ACUTE EFFECTS, WSF, TOXICITY, *TEMPERATURE EFFECTS
0854 " FISH, CRUDE OIL, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, TOXICITY, *ONCORHYNCHUS GORBUSCHA, *EUALUS SPP., *PANDALUS GONIURUS
0875 " CRUDE OIL, BIRDS, ALASKA , PETROLEUM PRODUCTS, TOXICITY, *HATCHING, *LARUS GLAUCESCENS
0882 " GROWTH, BIRDS, TOXICITY, SUBLETHAL EFFECTS, *ANAS PLATYRHYNCHOS
0884 " GROWTH, DISPERSANTS, CRUSTACEANS, TOXICITY, *IDOTEA BALTICA
0885 " BIOLOGICAL EFFECTS, WSF, TOXICITY, SUBLETHAL EFFECTS, REPRODUCTION, *COPEPOD, *NITOCRA AFFINIS
0887 " MOLLUSKS, MARINE ORGANISMS, DISPERSANTS, CONCENTRATIONS, TOXICITY
0889 " FUEL OIL, BIRDS, BIOLOGICAL EFFECTS, TOXICITY, REPRODUCTION
0930 " CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, ALASKA , PHYSICAL EFFECTS, SOIL, PLANTS, RECOVERY, *BLACK SPRUCE, *TUNDRA
1032 " MARINE ORGANISMS, INTERNATIONAL AGREEMENTS, OIL DISCHARGES, REGULATIONS, SPILL RESPONSE
1060 " FUEL OIL, ENVIRONMENTAL EFFECTS, COASTS, BIRDS, OIL TERMINALS, TANKERS, OIL SPILLS, WILDLIFE, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
0687 MOVEMENT, MONITORING, MODELS, DETECTION, OIL SPILLS, REMOTE SENSING
0703 " MONITORING, GREAT LAKES, DETECTION, REMOTE SENSING, *LANDSAT, *ERTS
0891 " HYDROCARBONS , FATE, ATLANTIC OCEAN, PETROLEUM PRODUCTS, SEDIMENTS, *NEW YORK BIGHT
0972 " DELAWARE BAY, CRUDE OIL, OIL SLICKS, OIL INDUSTRY, TANKERS
0977 " MODELS, GREENLAND, SPILL TRAJECTORIES, PREDICTIONS, *DAVIS STRAIT
0978 " MODELS, GROUNDWATER, CONTAMINATION
0980 " MODELS, SPILL TRAJECTORIES, OIL SLICKS, PREDICTIONS
R081 " MODELS, DISPERSION, SPILL TRAJECTORIES, RIVERS
R082 " MODELS, HYDROCARBONS , DISTRIBUTION, ALASKA , OIL-GAS LEASING
0715 MUTAGENS, MICROORGANISMS, CRUDE OIL, ANALYTICAL TECHNIQUES, PAH, *SALMONELLA TYPHIMURIUM/MICROSOMAL ACTIVATION
0732 " METABOLISM, HEALTH HAZARDS, CHEMICAL ANALYSIS, CARCINOGENS, PAH
R075 " FUEL OIL, BIOASSAY, BACTERIA, ANIMALS, TOXICITY, YEASTS
0993 NARRAGANSETT BAY, HYDROCARBONS , CONCENTRATIONS, BAYS, SAMPLING, CHEMICAL AHALYSIS, RIVERS, SEDIMENTS
0742 NATURAL SEEPAGE, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, PAH, SEDIMENTS, SEAWATER, *HEADSPACE SAMPLING
0751 " CHEMICAL ANALYSIS, CANADA, ARCTIC, SOURCE IDENTIFICATION, OIL SLICKS
0753 " CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, SPECTROSCOPY, WEATHERING, SANTA BARBARA CHANNEL, *IR
0764 NEW YORK, DISPERSANTS, BIODEGRADATION, SPILL CLEANUP, SHIPS, PERFORMANCE TESTING, POLLUTION CONTROL, *COREXIT 9527
0942 " FATE, ENVIRONMENTAL EFFECTS, CONTAMINATION, WASTEWATERS, *NEW YORK BIGHT
0987 " MODELS, DRIFT, BEHAVIOR, SPILL TRAJECTORIES
0711 NOAA, HYDROCARBONS , CHROMATOGRAPHY, ANALYTICAL TECHNIQUES
0825 " GULF OF MEXICO, DRILLING, DEVELOPMENT, CORAL REEFS, CONSERVATION, OIL-GAS LEASING, OFFSHORE, SEDIMENTATION, *MARINE SANCTUARY
0763 NORTH SEA, EQUIPMENT, EKOFISK BLOWOUT, SPILL CLEANUP, SPILL CONTAINMENT
0827 " MEDITERRANEAN SEA, EQUIPMENT, DRILLING, BLOWOUT PREVENTION, OFFSHORE, POLLUTION PREVENTION
0920 " LIABILITY, LEGISLATION, INTERNATIONAL CONVENTIONS, DEVELOPMENT, CONPENSATION, UK, NORWAY, OFFSHORE
0923 " HYDROCARBONS , FATE, EKOFISK BLOWOUT, DRIFT, DISTRIBUTION, BIOLOGICAL EFFECTS, BIODEGRADATION
0946 " INTERNATIONAL AGREEMENTS, FATE, EKOFISK BLOWOUT, BIOLOGICAL EFFECTS
0992 " DISTRIBUTION, SOURCES, STATISTICS, OIL INDUSTRY, OIL TRANSPORT, TAR
1006 " FISHERIES, DEVELOPMENT, OIL INDUSTRY, RESOURCE MANAGEMENT, OFFSHORE, UK
1054 " MONITORING, LEAKAGE, EQUIPMENT, DETECTION, PIPELINES, UK
0709 NORWAY, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, OIL SPILLS, SOURCES

0920 NORWAY, NORTH SEA, LIABILITY, LEGISLATION, INTERNATIONAL CONVENTIONS, DEVELOPMENT, CONPENSATION, UK, OFFSHORE
1002 " LEGISLATION, COMPENSATION, REGULATIONS, OIL INDUSTRY, SOLID WASTES
0768 OCEANS, FRANCE, DESIGN-ENGINEERING, SHIPS, SPILL CLEANUP, POLLUTION CONTROL
1112 " SOURCES, STATISTICS, TANKERS, WASTEWATERS, OIL DISCHARGES, NATURALSEEPAGE, *SCARLET PRAWN
R078 " MICROORGANISMS, DISTRIBUTION, BIODEGRADATION
0712 OCS, MONITORING, HYDROCARBONS , DISTRIBUTION, BIOGENIC HYDROCARBONS, BASELINE STUDIES, ALASKA , NATURAL SEEPS
0836 " MARINE ORGANISMS, HYDROCARBONS , BENTHOS, ALASKA , SEDIMENTS, UPTAKE, *DEPOSIT-FEEDERS
0898 " HABITATS, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, OFFSHORE, WILDLIFE, OIL TRANSPORT
0909 " HEALTH HAZARDS, FISH, CARCINOGENS, BERING SEA, BASELINE STUDIES, ALASKA , *PATHOLOGY
0910 " ENVIRONMENTAL EFFECTS, EIS, OIL-GAS LEASING, ONSHORE IMPACTS
0912 " HYDROCARBONS , DISTRIBUTION, BIOGENIC HYDROCARBONS, BEAUFORT SEA, BASELINE STUDIES, ALASKA , SEDIMENTATION
0916 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, DEEPWATER PORTS, OFFSHORE, OIL-GAS LEASING
0917 " MODELS, MARINE ENVIRONMENT, BEHAVIOR, BASELINE STUDIES, ATLANTIC OCEAN, PREDICTIONS, PHYSICAL ASPECTS
0918 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DEVELOPMENT, OIL-GAS LEASING, OFFSHORE, ONSHORE IMPACTS
0927 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, COASTAL ZONE MANAGEMENT, OFFSHORE, OIL-GAS LEASING
0979 " MODELS, FLORIDA, OIL SPILLS, SPILL TRAJECTORIES, PREDICTION
0982 " MODELS, RISK ANALYSIS, SPILL TRAJECTORIES, USGS
1000 " COASTAL ZONE MANAGEMENT, ONSHORE IMPACTS, OIL-GAS LEASING, SOCIOECONOMIC EFFECTS
1003 " GOVERNMENT AGENCIES, DEVELOPMENT, OIL-GAS LEASING, OFFSHORE, REGULATIONS, *US FISH & WILDLIFE SERVICE
1005 " LEGISLATION, DEVELOPMENT, COASTAL ZONE MANAGEMENT, OIL-GAS LEASING, REGULATIONS, RESOURCE MANAGEMENT, *PUBLIC PARTICIPATION
1008 " LOUISIANA, GULF OF MEXICO, DRILLING, CHRONIC EFFECTS, BLM, PRODUCTION, PLATFORMS
1013 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, CALIFORNIA, OIL-GAS LEASING, OFFSHORE, SANTA BARBARA CHANNEL
1016 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, ATLANTIC COAST, OIL-GAS LEASING, OFFSHORE, SOCIOECONOMIC EFFECTS
1019 " GULF OF ALASKA, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, OFFSHORE, ONSHORE IMPACTS, OREGON, WASHINGTON
1021 " GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, OFFSHORE, ONSHORE IMPACTS, WETLANDS
1023 " HYDROCARBONS , ENVIRONMENTAL EFFECTS, DRILLING, WASTEWATERS, *BATEA, *NSPS
1025 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, SAFETY, USCG
1026 " GEORGES BANK, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, OFFSHORE, SOCIOECONOMIC EFFECTS, *NEW ENGLAND
1027 " INTERNATIONAL AGREEMENTS, DEVELOPMENT, OFFSHORE, PRODUCTION, TANKERS, OIL TRANSPORT, REFINING, *CHINA SEA, *MARINE REGIONALISM
1043 " DEVELOPMENT, TANKERS, SHIPS, PORTS
0726 OFFSHORE, GULF OF MEXICO, CONCENTRATIONS, BIOGENIC HYDROCARBONS, SAMPLING, OIL DISCHARGES, PLANKTON, *BUCCANEER OILFIELD, *ALKANES
0727 " HYDROCARBONS , GULF OF MEXICO, CONCENTRATIONS, SAMPLING, OIL DISCHARGES, PLATFORMS, *BUCCANEER OILFIELD, *ALKANES
0728 " GULF OF MEXICO, BIOGENIC HYDROCARBONS, SAMPLING, OIL DISCHARGES, SEDIMENTS, *BUCCANEER OILFIELD, *ALKANES
0736 " INDIA, HYDROCARBONS , CONCENTRATIONS, COASTAL WATERS, SAMPLING
0813 " MASSACHUSETTS, GEORGES BANK, DEVELOPMENT, COASTAL ZONE MANAGEMENT
0819 " INTERNATIONAL AGREEMENTS, GREENLAND, DENMARK, CANADA, POLLUTION PREVENTION, SPILL CLEANUP
0825 " NOAA, GULF OF MEXICO, DRILLING, DEVELOPMENT, CORAL REEFS, CONSERVATION, OIL-GAS LEASING, SEDIMENTATION, *MARINE SANCTUARY
0827 " NORTH SEA, MEDITERRANEAN SEA, EQUIPMENT, DRILLING, BLOWOUT PREVENTION, POLLUTION PREVENTION
0829 " EQUIPMENT, DRILLING, DESIGN-ENGINEERING, BLOWOUT PREVENTION, OIL WELLS, POLLUTION PREVENTION, SAFETY
0896 " ICE, EIS, DRILLING, COLD CLIMATES, CANADA, BLOWOUTS, *LANCASTER SOUND
0898 " OCS, HABITATS, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, WILDLIFE, OIL TRANSPORT
0916 " OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, DEEPWATER PORTS, OIL-GAS LEASING
0918 " OCS, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DEVELOPMENT, OIL-GAS LEASING, ONSHORE IMPACTS
0920 " NORWAY, NORTH SEA, LIABILITY, LEGISLATION, INTERNATIONAL CONVENTIONS, DEVELOPMENT, CONPENSATION, UK
0927 " OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, COASTAL ZONE MANAGEMENT, OIL-GAS LEASING
0995 " MICROORGANISMS, MARINE ENVIRONMENT, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL, PLATFORMS, SEDIMENTS

0998 OFFSHORE, MODELS, ICE, GREENLAND, DRILLING, DRIFT, SAFETY, OIL SPILLS, *DAVIS STRAIT
1001 " LOUISIANA, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, DEEPWATER PORTS, TANKERS
1003 " OCS, GOVERNMENT AGENCIES, DEVELOPMENT, OIL-GAS LEASING, REGULATIONS, *US FISH & WILDLIFE SERVICE
1006 " NORTH SEA, FISHERIES, DEVELOPMENT, OIL INDUSTRY, RESOURCE MANAGEMENT, UK
1007 " ENVIRONMENTAL EFFECTS, DRILLING, OIL-GAS LEASING, PRODUCTION, SAFETY
1009 " LOUISIANA, DRILLING, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, PRODUCTION, PHYSICAL EFFECTS, *OFFSHORE ECOLOGY INVESTIGATION
1013 " OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CALIFORNIA, OIL-GAS LEASING, SANTA BARBARA CHANNEL
1016 " OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, ATLANTIC COAST, OIL-GAS LEASING, SOCIOECONOMIC EFFECTS
1019 " OCS, GULF OF ALASKA, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, ONSHORE IMPACTS, OREGON, WASHINGTON
1020 " MODELS, ENVIRONMENTAL EFFECTS, OIL-GAS LEASING, OIL FIELDS, TEXAS
1021 " OCS, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, ONSHORE IMPACTS, WETLANDS
1026 " OCS, GEORGES BANK, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, SOCIOECONOMIC EFFECTS, *NEW ENGLAND
1027 " OCS, INTERNATIONAL AGREEMENTS, DEVELOPMENT, PRODUCTION, TANKERS, OIL TRANSPORT, REFINING, *CHINA SEA, *MARINE REGIONALISM
1115 " INFORMATION SYSTEMS, EXPLORATION, OIL-GAS LEASING, REGULATIONS
0726 OIL DISCHARGES, OFFSHORE, GULF OF MEXICO, CONCENTRATIONS, BIOGENIC HYDROCARBONS, SAMPLING, PLANKTON, *BUCCANEER OILFIELD, *ALKANES
0727 " OFFSHORE, HYDROCARBONS , GULF OF MEXICO, CONCENTRATIONS, SAMPLING, PLATFORMS, *BUCCANEER OILFIELD, *ALKANES
0728 " OFFSHORE, GULF OF MEXICO, BIOGENIC HYDROCARBONS, SAMPLING, SEDIMENTS, *BUCCANEER OILFIELD, *ALKANES
0822 " IMCO, EQUIPMENT TANKERS, REGULATIONS, USCG, OIL-WATER SEPARATION
0855 " ECOSYSTEMS, PAH, TOXICITY, OIL INDUSTRY
0933 " ENVIRONMENTAL EFFECTS, BEACHES, BALLAST , OIL TERMINALS, TANKERS, SCOTLAND, *SHETLAND ISLANDS
0941 " JAPAN, CONTAMINATION, COASTAL ZONE MANAGEMENT, COASTAL WATERS, SHIPS, TANKERS
1032 " MORTALITY, MARINE ORGANISMS, INTERNATIONAL AGREEMENTS, REGULATIONS, SPILL RESPONSE
1046 " BALLAST , TANKERS, REGULATIONS, STATISTICS, SOURCES, *ACCIDENTS
1050 " MONITORING, EQUIPMENT, BALLAST , TANKERS, SHIPS, OIL SLICKS
1063 " TANKERS, REGULATIONS, US, USCG, SEGREGATED BALLAST, WASTEWATERS, POLLUTION CONTROL, PORTS
1112 " OCEANS, SOURCES, STATISTICS, TANKERS, WASTEWATERS, NATURALSEEPAGE, *SCARLET PRAWN
1020 OIL FIELDS, OFFSHORE, MODELS, ENVIRONMENTAL EFFECTS, OIL-GAS LEASING, TEXAS
0825 OIL-GAS LEASING, OFFSHORE, NOAA, GULF OF MEXICO, DRILLING, DEVELOPMENT, CORAL REEFS, CONSERVATION, SEDIMENTATION, *MARINE SANCTUARY
0898 " OFFSHORE, OCS, HABITATS, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, WILDLIFE, OIL TRANSPORT
0910 " OCS, ENVIRONMENTAL EFFECTS, EIS, ONSHORE IMPACTS
0916 " OFFSHORE, OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, DEEPWATER PORTS
0918 " OFFSHORE, OCS, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DEVELOPMENT, ONSHORE IMPACTS
0927 " OFFSHORE, OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, COASTAL ZONE MANAGEMENT
0938 " MARINE ORGANISMS, MARINE MAMMALS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL, PETROLEUM PRODUCTS
1000 " OCS, COASTAL ZONE MANAGEMENT, ONSHORE IMPACTS, SOCIOECONOMIC EFFECTS
1003 " OFFSHORE, OCS, GOVERNMENT AGENCIES, DEVELOPMENT, REGULATIONS, *US FISH & WILDLIFE SERVICE
1005 " OCS, LEGISLATION, DEVELOPMENT, COASTAL ZONE MANAGEMENT, REGULATIONS, RESOURCE MANAGEMENT, *PUBLIC PARTICIPATION
1007 " OFFSHORE, ENVIRONMENTAL EFFECTS, DRILLING, PRODUCTION, SAFETY
1013 " OFFSHORE, OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CALIFORNIA, SANTA BARBARA CHANNEL
1016 " OFFSHORE, OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, ATLANTIC COAST, SOCIOECONOMIC EFFECTS
1019 " OFFSHORE. OCS, GULF OF ALASKA, ENVIRONMENTAL EFFECTS, DEVELOPMENT, ONSHORE IMPACTS, OREGON, WASHINGTON
1020 " OIL FIELDS, OFFSHORE, MODELS, ENVIRONMENTAL EFFECTS, TEXAS
1021 " OFFSHORE, OCS, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DEVELOPMENT, ONSHORE IMPACTS, WETLANDS
1025 " OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, SAFETY, USCG
1026 " OFFSHORE, OCS, GEORGES BANK, ENVIRONMENTAL EFFECTS, DEVELOPMENT, SOCIOECONOMIC EFFECTS, *NEW ENGLAND
1115 " OFFSHORE, INFORMATION SYSTEMS, EXPLORATION, REGULATIONS
R082 " MOVEMENT, MODELS, HYDROCARBONS , DISTRIBUTION, ALASKA
0809 OIL INDUSTRY, DELAWARE, SPILL COOPERATIVES, SPILL RESPONSE, POLLUTION PREVENTION, POLLUTION CONTROL, RIVERS
0810 " SPILL COOPERATIVES, SPILL RESPONSE, PERSONNEL TRAINING
0811 " CONTINGENCY PLANNING, SPILL COOPERATIVES, SPILL RESPONSE

0815	OIL	INDUSTRY, GOVERNMENT AGENCIES, CONTINGENCY PLANNING, CANADA, SPILL COOPERATIVES
0816	"	INTERNATIONAL CONVENTIONS, IMCO, GOVERNMENT AGENCIES, CONTINGENCY PLANNING, *UNEP
0817	"	GUIDELINES, EPA, CONTINGENCY PLANNING, SPILL RESPONSE, *INLAND SPILLS
0828	"	EXPLORATION, EUROPE, POLLUTION PREVENTION, PRODUCTION, OIL TRANSPORT, REFINING
0855	"	OIL DISCHARGES, ECOSYSTEMS, PAH, TOXICITY
0972	"	MOVEMENT, DELAWARE BAY, CRUDE OIL, OIL SLICKS, TANKERS
0992	"	NORTH SEA, DISTRIBUTION, SOURCES, STATISTICS, OIL TRANSPORT, TAR
1002	"	NORWAY, LEGISLATION, COMPENSATION, REGULATIONS, SOLID WASTES
1004	"	GUIDELINES, EUROPE, ENVIRONMENTAL EFFECTS, REGULATIONS, STATISTICS
1006	"	OFFSHORE, NORTH SEA, FISHERIES, DEVELOPMENT, RESOURCE MANAGEMENT, UK
1030	"	LOUISIANA, DEVELOPMENT, BASELINE STUDIES, RESOURCE MANAGEMENT
1111	"	LEGISLATION, EPA, SOLID WASTES, REGULATIONS
1113	"	ECONOMIC EFFECTS, COST ANALYSIS, POLLUTION CONTROL, REFINERIES
1116	"	HEALTH HAZARDS, SAFETY, *ACCIDENTS
0832	OIL	SHALE, MONITORING, EPA, CONTAMINATION, CHEMICAL ANALYSIS, POLLUTION CONTROL, SAMPLING
0914	"	ENVIRONMENTAL EFFECTS, DOE, DEVELOPMENT
0928	"	FOSSIL FUELS, ENVIRONMENTAL EFFECTS, RISK ANALYSIS
0944	"	INDUSTRIES, EXTRACTION, ENVIRONMENTAL EFFECTS, BALTIC SEA, PETROLEUM PRODUCTS, PRODUCTION, DISCHARGES, POLLUTION CONTROL
1011	"	MODELS, ENVIRONMENTAL EFFECTS, REGULATION, WASTEWATERS, RESOURCE MANAGEMENT, COLORADO
1012	"	GROUNDWATER, ENVIRONMENTAL EFFECTS, BIBLIOGRAPHIES, RESOURCE MANAGEMENT, WASTEWATERS, REGULATIONS, COLORADO
1091	"	BIBLIOGRAPHIES, SOLID WASTES, WASTEWATERS, DISPOSAL
1092	"	ENVIRONMENTAL EFFECTS, DISPOSAL
0681	OIL	SLICKS, EQUIPMENT, DETECTION, DESIGN-ENGINEERING, CONTAMINATION, PATENT
0684	"	DETECTION, CRUDE OIL, SEA SURFACE, PHYSICAL ASPECTS, *CAPACITANCE, *LASER REFLECTANCE
0692	"	EQUIPMENT, DETECTION, DESIGN-ENGINEERING, PATENT
0695	"	MONITORING, DETECTION, REMOTE SENSING, TANKERS, SHIPS, SWEDEN
0696	"	MONITORING, HYDROCARBONS , DETECTION, REMOTE SENSING, *PROCEEDINGS
0751	"	NATURAL SEEPAGE, CHEMICAL ANALYSIS, CANADA, ARCTIC, SOURCE IDENTIFICATION
0783	"	EQUIPMENT, CRUDE OIL, BURNING, SPILL REMOVAL, PERFORMANCE TESTING, *INCENDIARY DEVICES
0787	"	SPILL CLEANUP, SURFACTANTS, SINKING AGENT, PATENT
0968	"	HYDROCARBONS , EVAPORATION, CONCENTRATIONS, BEHAVIOR
0970	"	MODELS, FATE, EVAPORATION
0972	"	OIL INDUSTRY, MOVEMENT, DELAWARE BAY, CRUDE OIL, TANKERS
0980	"	MOVEMENT, MODELS, SPILL TRAJECTORIES, PREDICTIONS
0983	"	DRIFT, SPREADING, SEA SURFACE
1050	"	OIL DISCHARGES, MONITORING, EQUIPMENT, BALLAST , TANKERS, SHIPS
1087	"	ADSORPTION, WASTEWATER TREATMENT, SORBENTS, PATENT
0683	OIL	SPILLS, ICE, DETECTION, COLD CLIMATES
0687	"	MOVEMENT, MONITORING, MODELS, DETECTION, REMOTE SENSING
0688	"	MONITORING, INTERNATIONAL AGREEMENTS, CONTINGENCY PLANNING, RESOURCE MANAGEMENT, *IGOSS
0701	"	CANADA, BEHAVIOR, REMOTE SENSING, PHYSICAL ASPECTS, SEA SURFACE, PERFORMANCE TESTING
0702	"	DETECTION, REMOTE SENSING, SURVEILLANCE
0709	"	NORWAY, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, SOURCES
0739	"	ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, *MULTICOMPONENT FLUORESCENCE
0747	"	MODELS, INFORMATION SYSTEMS, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, *PATTERN RECOGNITION
0801	"	MORTALITY, ENVIRONMENTAL EFFECTS, BIRDS, ANIMALS, SPILL CLEANUP, SCOTLAND, *ESSO BERNICIA SPILL
0835	"	MORTALITY, BIRDS, BIOLOGICAL EFFECTS, OIL TRANSFER, UK, *WALES, *PODICEPS CRISTATUS
0838	"	MORTALITY, INVERTEBRATES, FRESHWATER, CANADA, BENTHOS, TAR SANDS, SLUDGE , TOXICITY, RIVERS
0847	"	MORTALITY, MARINE MAMMALS, ENVIRONMENTAL EFFECTS, CANADA, BEHAVIOR, *BRITISH COLUMBIA, *ENHYDRA LUTRIS
0860	"	ENVIRONMENTAL EFFECTS, CONTINGENCY PLANNING, BIOLOGICAL EFFECTS, SPILL RESPONSE
0879	"	MICROORGANISMS, CRUDE OIL, BIOLOGICAL EFFECTS, ALASKA , *TUNDRA
0893	"	ECONOMICS, COST ANALYSIS, SOCIOECONOMIC EFFECTS, ONSHORE IMPACTS, SANTA BARBARA CHANNEL
0894	"	ICE, ENVIRONMENTAL EFFECTS, COLD CLIMATES, CANADA
0921	"	FATE, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BALTIC SEA, WASTEWATERS
0932	"	INVERTEBRATES, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, PLANTS, REMOTE SENSING, *MANGROVE FORESTS
0936	"	ENVIRONMENTAL EFFECTS, CHRONIC EFFECTS, AFRICA, RECOVERY, TANKERS, *VENPET-VENOIL SPILL
0937	"	INTERTIDAL ZONE, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, PHYSICAL EFFECTS, *EXPERIMENTAL DESIGN
0945	"	EPA, ENVIRONMENTAL EFFECTS, POLLUTION PREVENTION, POLLUTION CONTROL, SPILL CLEANUP, *RESEARCH SUMMARY

0952 OIL SPILLS, MICROORGANISMS, MARINE ENVIRONMENT, BIODEGRADATION
0975 " FATE, BIODEGRADATION, BERMUDA, TAR, WEATHERING, TROPICAL REGIONS
0979 " OCS, MODELS, FLORIDA, SPILL TRAJECTORIES, PREDICTION
0984 " MODELS, INFORMATION SYSTEMS, CANADA, STATISTICS, PREDICTIONS
0985 " MODELS, DISPERSION, *WAVE ACTION
0986 " MODELS, DRIFT, BEHAVIOR, SPILL TRAJECTORIES, SEA SURFACE, PREDICITIONS
0998 " OFFSHORE, MODELS, ICE, GREENLAND, DRILLING, DRIFT, SAFETY, *DAVIS STRAIT
1015 " TRANS-ALASKA PIPELINE, RESOURCE MANAGEMENT
1022 " KUWAIT, DEVELOPMENT, CRUDE OIL, SOCIOECONOMIC EFFECTS, SOLID WASTES
1033 " ICE, FUEL OIL, COLD CLIMATES, CANADA, TANKERS, *KURDISTAN SPILL, *NOVA SCOTIA
1037 " BALLAST , TANKERS, SAFETY, PERSONNEL TRAINING, POLLUTION PREVENTION
1038 " IRELAND, ENVIRONMENTAL EFFECTS, BAYS, TANKERS, SPREADING, SPILL CLEANUP, *BETELGEUSE SPILL
1056 " FUEL OIL, ENVIRONMENTAL EFFECTS, SPILL RESPONSE, OIL TERMINALS, SCOTLAND, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1060 " MORTALITY, FUEL OIL, ENVIRONMENTAL EFFECTS, COASTS, BIRDS, OIL TERMINALS, TANKERS, WILDLIFE, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1061 " ENVIRONMENTAL EFFECTS, OIL TERMINALS, TANKERS, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1062 " FUEL OIL, BIOLOGICAL EFFECTS, OIL TERMINALS, TANKERS, OIL-WATER SEPARATION, SURVEILLANCE, SCOTLAND, *SULLOM VOE TERMINAL
1065 " SAFETY, TANKERS, PERSONNEL TRAINING, REGULATIONS
1070 " IRELAND, STATISTICS, UK
1114 " ISRAEL, RESOURCE MANAGEMENT, RED SEA
R070 " CRUDE OIL, REMOTE SENSING, WEATHERING, SOURCE IDENTIFICATION, PHYSICAL ASPECTS
R071 " DETECTION, REMOTE SENSING, PERFORMANCE TESTING, SANTA BARBARA CHANNEL, *IR
0770 OIL TANKS, ICE, COLD CLIMATES, ALASKA , SPILL REMOVAL, SPILL CLEANUP, SORBENTS
0933 OIL TERMINALS, OIL DISCHARGES, ENVIRONMENTAL EFFECTS, BEACHES, BALLAST , TANKERS, SCOTLAND, *SHETLAND ISLANDS
1056 " OIL SPILLS, FUEL OIL, ENVIRONMENTAL EFFECTS, SPILL RESPONSE, SCOTLAND, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1057 " CONTINGENCY PLANNING, SPILL RESPONSE, SPILL CLEANUP, TANKERS, SCOTLAND, *ESSO BERNICIA SPILL, *SULLOM VOE TERMINAL
1058 " LEAKAGE, HYDROCARBONS , CRUDE OIL, PETROLEUM PRODUCTS, OIL TRANSFER, POLLUTION CONTROL, TANKERS
1060 " OIL SPILLS, MORTALITY, FUEL OIL, ENVIRONMENTAL EFFECTS, COASTS, BIRDS, TANKERS, WILDLIFE, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1061 " OIL SPILLS, ENVIRONMENTAL EFFECTS, TANKERS, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1062 " OIL SPILLS, FUEL OIL, BIOLOGICAL EFFECTS, TANKERS, OIL-WATER SEPARATION, SURVEILLANCE, SCOTLAND, *SULLOM VOE TERMINAL
0748 OIL TRANSFER, EQUIPMENT, SOURCE IDENTIFICATION, POLLUTION PREVENTION
0835 " OIL SPILLS, MORTALITY, BIRDS, BIOLOGICAL EFFECTS, UK, *WALES, *PODICEPS CRISTATUS
1058 " OIL TERMINALS, LEAKAGE, HYDROCARBONS , CRUDE OIL, PETROLEUM PRODUCTS, POLLUTION CONTROL, TANKERS
1059 " EQUIPMENT, TANKERS, POLLUTION PREVENTION
1069 " GUIDELINES, GASOLINE, ECONOMICS, COST ANALYSIS, POLLUTION PREVENTION, REGULATIONS
1072 " DELAWARE BAY, SAFETY OIL TRANSPORT, TANKERS, POLLUTION PREVENTION, REGULATIONS
0823 OIL TRANSPORT, USCG, REGULATIONS, POLLUTION PREVENTION, TANKERS
0828 " OIL INDUSTRY, EXPLORATION, EUROPE, POLLUTION PREVENTION, PRODUCTION, REFINING
0897 " HYDROCARBONS , GULF OF ALASKA, BASELINE STUDIES, ANALYTICAL TECHNIQUES, TRANS-ALASKA PIPELINE
0898 " OIL-GAS LEASING, OFFSHORE, OCS, HABITATS, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, WILDLIFE
0908 " HYDROCARBONS , CHROMATOGRAPHY, BASELINE STUDIES, PORTS , PUGET SOUND
0931 " LEGISLATION, EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, BEHAVIOR, SPILL RESPONSE, POLLUTION PREVENTION, POLLUTION CONTROL, *CONFERENCE
0992 " OIL INDUSTRY, NORTH SEA, DISTRIBUTION, SOURCES, STATISTICS, TAR
1027 " OFFSHORE, OCS, INTERNATIONAL AGREEMENTS, DEVELOPMENT, PRODUCTION, TANKERS, REFINING, *CHINA SEA, *MARINE REGIONALISM
1031 " LIABILITY, LAW ENFORCEMENT, INTERNATIONAL AGREEMENTS, IMCO, TANKERS, SAFETY, REGULATIONS
1041 " MONITORING, INTERNATIONAL AGREEMENTS, ENGLISH CHANNEL, TANKERS, SAFETY, REGULATIONS
1045 " EQUIPMENT, DESIGN-ENGINEERING, TANKERS, REGULATIONS, SEGREGATED BALLAST
1047 " ECONOMICS, DESIGN-ENGINEERING, ARCTIC, TANKERS, RISK ANALYSIS, *SUBMARINE TANKERS
1049 " POLLUTION CONTROL, TANKERS, SAFETY
1064 " LIABILITY, LEGISLATION, INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, TANKERS, SHIPS, REGULATIONS, *LAW OF THE SEA
1066 " COASTAL ZONE MANAGEMENT, REGULATIONS
1071 " ENVIRONMENTAL EFFECTS, ALASKA , POLLUTION PREVENTION, TANKERS, TRANS-ALASKA PIPELINE
1072 " OIL TRANSFER, DELAWARE BAY, SAFETY, TANKERS, POLLUTION PREVENTION, REGULATIONS
0758 OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, PATENT
0761 " DESIGN-ENGINEERING, SPILL CLEANUP, SPILL REMOVAL, SKIMMERS, SHIPS
0781 " AROMATIC HYDROCARBONS, ADSORPTION, SORBENTS

0782 OIL-WATER SEPARATION, EQUIPMENT, ARCTIC, SPILL CLEANUP, PERFORMANCE TESTING
0799 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, SHIPS, PATENT
0822 " OIL DISCHARGES, IMCO, EQUIPMENT, TANKERS, REGULATIONS, USCG
1062 " OIL TERMINALS, OIL SPILLS, FUEL OIL, BIOLOGICAL EFFECTS, TANKERS, SURVEILLANCE, SCOTLAND, *SULLOM VOE TERMINAL
1084 " EMULSIONS, WASTEWATERS, WASTEWATER TREATMENT, PATENT
1086 " GUIDELINES, COST ANALYSIS, REFINERIES, WASTEWATERS, PETROLEUM PRODUCTS, POLLUTION PREVENTION
1089 " FILTRATION, EMULSIONS, WASTEWATER TREATMENT, OXIDATION, PATENT
1095 " ADSORPTION, WASTEWATER TREATMENT, PATENT, *FERRITE POWDER
1096 " ADSORPTION, WASTEWATER TREATMENT, PATENT, *FERRITE POWDER
1097 " FILTRATION, WASTEWATER TREATMENT, PATENT
1100 " FILTRATION, SORBENTS, PATENT
1101 " BALLAST , TANKERS, SHIPS
1102 " EQUIPMENT, DESIGN-ENGINEERING, POLLUTION PREVENTION
1103 " ABSORPTION, PATENT
1104 " DESIGN-ENGINEERING, PATENT
1105 " HYDROCARBONS , EMULSIONS, PATENT
0829 OIL WELLS, OFFSHORE, EQUIPMENT, DRILLING, DESIGN-ENGINEERING, BLOWOUT PREVENTION, POLLUTION PREVENTION, SAFETY
0833 " DRILLING, BLOWOUTS, POLLUTION CONTROL
0893 ONSHORE IMPACTS, OIL SPILLS, ECONOMICS, COST ANALYSIS, SOCIOECONOMIC EFFECTS, SANTA BARBARA CHANNEL
0910 " OIL-GAS LEASING, OCS, ENVIRONMENTAL EFFECTS, EIS
0918 " OIL-GAS LEASING, OFFSHORE, OCS, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DEVELOPMENT
1000 " OIL-GAS LEASING, OCS, COASTAL ZONE MANAGEMENT, SOCIOECONOMIC EFFECTS
1019 " OIL-GAS LEASING, OFFSHORE, OCS, GULF OF ALASKA, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OREGON, WASHINGTON
1021 " OIL-GAS LEASING, OFFSHORE, OCS, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DEVELOPMENT, WETLANDS
R083 " HABITATS, DRILLING, DISTRIBUTION, DEVELOPMENT, ANIMALS, *ELK
1019 OREGON, ONSHORE IMPACTS, OIL-GAS LEASING, OFFSHORE, OCS, GULF OF ALASKA, ENVIRONMENTAL EFFECTS, DEVELOPMENT, WASHINGTON
0790 OXIDATION, BIOLOGICAL TREATMENT, OIL REMOVAL, SEDIMENTS, POLLUTION CONTROL, PATENT
1089 " OIL-WATER SEPARATION, FILTRATION, EMULSIONS, WASTEWATER TREATMENT, PATENT
0706 PAH, DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES
0707 " FRESHWATER, DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, SAMPLING, SEDIMENTS
0715 " MUTAGENS, MICROORGANISMS, CRUDE OIL, ANALYTICAL TECHNIQUES, *SALMONELLA TYPHIMURIUM/MICROSOMAL ACTIVATION
0722 " CHROMATOGRAPHY, BIOASSAY, ANALYTICAL TECHNIQUES, TOXICITY
0723 " LOUISIANA, LAKES , DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, *AIR-WATER INTERFACE
0732 " MUTAGENS, METABOLISM, HEALTH HAZARDS, CHEMICAL ANALYSIS, CARCINOGENS
0742 " NATURAL SEEPAGE, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, SEDIMENTS, SEAWATER, *HEADSPACE SAMPLING
0855 " OIL INDUSTRY, OIL DISCHARGES, ECOSYSTEMS, TOXICITY
0939 " MARSHES, FRESHWATER, FISH, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, ST. LAWRENCE RIVER, WILDLIFE, *NEPCO 140 SPILL
0971 " FATE, CRANKCASE OIL, SEDIMENTS, *STORMWATER RUNOFF
0973 " FATE, CARCINOGENS, *VOLITILIZATION
0681 PATENT, OIL SLICKS, EQUIPMENT, DETECTION, DESIGN-ENGINEERING, CONTAMINATION
0691 " EQUIPMENT, DETECTION, DESIGN-ENGINEERING
0692 " OIL SLICKS, EQUIPMENT, DETECTION, DESIGN-ENGINEERING
0756 " DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT
0757 " EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT
0758 " OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT
0759 " DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT
0760 " DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT
0769 " DISPERSANTS, SURFACTANTS, SPILL CLEANUP, SEA SURFACE
0771 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SPILL REMOVAL
0772 " EQUIPMENT, BOOMS, SPILL CLEANUP, SHIPS, DISIGN-ENGINEERING
0773 " DESIGN-ENGINEERING, SPILL REMOVAL
0775 " DESIGN-ENGINEERING, OIL REMOVAL, TANKERS, *PUMPING
0776 " EQUIPMENT, DESIGN-ENGINEERING, OIL REMOVAL, TANKERS
0777 " OIL REMOVAL, TANKERS, DESIGN-ENGINEERNG, *PUMPING
0778 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS
0784 " EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL
0785 " EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS
0787 " OIL SLICKS, SPILL CLEANUP, SURFACTANTS, SINKING AGENT
0788 " SPILL CLEANUP, *GELLING AGENT
0789 " LAND SPILLS, CONTAMINATION, SPILL CLEANUP, WASTE OIL TREATMENT
0790 " OXIDATION, BIOLOGICAL TREATMENT, OIL REMOVAL, SEDIMENTS, POLLUTION CONTROL
0796 " DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS
0797 " EQUIPMENT, DESIGN-ENGINEERING, OIL REMOVAL, SHIPS
0799 " OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, SHIPS

0800 PATENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS
0802 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS
0803 " EMULSIONS, ADSORPTION, SPILL CLEANUP, SORBENTS
0605 " EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, SKIMMERS
0962 " MICROORGANISMS, BIODEGRADATION
1053 " MONITORING, LEAKAGE, EQUIPMENT, DETECTION, DESIGN-ENGINEERING, PIPELINES, REFINERIES
1055 " LEAKAGE, EQUIPMENT, DETECTION, DESIGN-ENGINEERING, PIPELINES
1078 " LUBRICATING OIL, WASTE OIL TREATMENT, RECLAMATION
1084 " OIL-WATER SEPARATION, EMULSIONS, WASTEWATERS, WASTEWATER TREATMENT
1087 " OIL SLICKS, ADSORPTION, WASTEWATER TREATMENT, SORBENTS
1089 " OXIDATION, OIL-WATER SEPARATION, FILTRATION, EMULSIONS, WASTEWATER TREATMENT
1090 " FILTRATION, EMULSIONS, WASTEWATER TREATMENT, COMBUSTION
1093 " HYDROCARBONS , WASTEWATER TREATMENT
1094 " EMULSIONS, WASTEWATER TREATMENT
1095 " OIL-WATER SEPARATION, ADSORPTION, WASTEWATER TREATMENT, *FERRITE POWDER
1096 " OIL-WATER SEPARATION, ADSORPTION, WASTEWATER TREATMENT, *FERRITE POWDER
1097 " OIL-WATER SEPARATION, FILTRATION, WASTEWATER TREATMENT
1098 " FILTRATION, WASTEWATER TREATMENT
1100 " OIL-WATER SEPARATION, FILTRATION, SORBENTS
1103 " OIL-WATER SEPARATION, ABSORPTION
1104 " OIL-WATER SEPARATION, DESIGN-ENGINEERING
1105 " OIL-WATER SEPARATION, HYDROCARBONS , EMULSIONS
1109 " LUBRICATING OIL, RECLAMATION, *FE-CONTAMINATED OILS
0701 PERFORMANCE TESTING, OIL SPILLS, CANADA, BEHAVIOR, REMOTE SENSING, PHYSICAL ASPECTS, SEA SURFACE
0764 " NEW YORK, DISPERSANTS, BIODEGRADATION, SPILL CLEANUP, SHIPS, POLLUTION CONTROL, *COREXIT 9527
0774 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, *OHMSETT
0780 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, UK, PRODUCT INFORMATION, *INVICTACAT
0782 " OIL-WATER SEPARATION, EQUIPMENT, ARCTIC, SPILL CLEANUP
0783 " OIL SLICKS, EQUIPMENT, CRUDE OIL, BURNING, SPILL REMOVAL, *INCENDIARY DEVICES
0793 " EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CLEANUP, SKIMMERS, *OHMSETT
0794 " EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CLEANUP, SKIMMERS, *OHMSETT
0804 " DISPERSANTS, CONTINGENCY PLANNING, CHEMICAL EFFECTS, CALIFORNIA, BIOLOGICAL EFFECTS, SPILL CLEANUP
0806 " EQUIPMENT, DESIGN-ENGINEERING, POLLUTION CONTROL, SPILL CLEANUP, *TOWED PLANING SLED
0954 " BIODEGRADATION, BACTERIA, SPILL CLEANUP
1048 " DESIGN-ENGINEERING, TANKERS, POLLUTION PREVENTION, *SINKING TESTS
R071 " OIL SPILLS, DETECTION, REMOTE SENSING, SANTA BARBARA CHANNEL, *IR
R085 " EQUIPMENT, WASTEWATER TREATMENT, RECYCLING, *MICRO-GAS-DISPERSION STRIPPING
0807 PERSONNEL TRAINING, BLOWOUT PREVENTION
0808 " CONTINGENCY PLANNING, SPILL RESPONSE, SPILL CLEANUP, REGULATION, *VIDEO TAPES
0810 " OIL INDUSTRY, SPILL COOPERATIVES, SPILL RESPONSE
1037 " OIL SPILLS, BALLAST , TANKERS, SAFETY, POLLUTION PREVENTION
1042 " API, TANKERS, SAFETY, POLLUTION PREVENTION, REGULATIONS
1065 " OIL SPILLS, SAFETY, TANKERS, REGULATIONS
0710 PETROCHEMICALS, DETECTION, CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, *FLUORESCENCE
0883 " CONTAMINATION, ANIMALS, PLANTS
1077 " EQUIPMENT, WASTE OIL TREATMENT, SLUDGES, REFINERIES, USSR
1088 " LAND FARMING, SLUDGE, DISPOSAL, REFINERIES
0689 PETROLEUM PRODUCTS, DETECTION, CHROMATOGRAPHY, WASTEWATERS, *HEAD-SPACE METHOD
0710 " PETROCHEMICALS, DETECTION, CHEMICAL ANALYSIS, *FLUORESCENCE
0714 " EVAPORATION, CHEMICAL ANALYSIS, PHYSICAL ASPECTS, TOXICITY
0724 " STATISTICS, SPECTROSCOPY, STATISTICAL ANALYSIS
0729 " DETECTION, CHEMICAL ANALYSIS, SPECTROMETRY, *FLUORESCENCE SPECTROPHOTOMETRY
0731 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, *GRAVIMETRIC ANALYSIS
0740 " HYDROCARBONS , CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, SAMPLING, SOLUBILITY, *PARTITION COEFFICIENTS
0743 " HYDROCARBONS , DETECTION, CHROMATOGRAPHY, ANIMALS, ANALYTICAL TECHNIQUES, *RUMINANTS
0874 " FISH, DELAWARE BAY, CRUDE OIL, BIOLOGICAL EFFECTS, SOURCES, TOXICITY, SHELLFISH, *URBAN RUNOFF
0875 " MORTALITY, CRUDE OIL, BIRDS, ALASKA , TOXICITY, *HATCHING, *LARUS GLAUCESCENS
0891 " MOVEMENT, HYDROCARBONS , FATE, ATLANTIC OCEAN, SEDIMENTS, *NEW YORK BIGHT
0892 " CONCENTRATIONS, SEDIMENTS, WATER QUALITY, *DREDGING
0938 " OIL-GAS LEASING, MARINE ORGANISMS, MARINE MAMMALS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL
0944 " OIL SHALE, INDUSTRIES, EXTRACTION, ENVIRONMENTAL EFFECTS, BALTIC SEA, PRODUCTION, DISCHARGES, POLLUTION CONTROL
0961 " HYDROCARBONS , GROWTH, FUNGI, CONCENTRATIONS, BIODEGRADATION, TAR, *FUSARIUM
0989 " MARINE ENVIRONMENT, LEGISLATION, HYDROCARBONS , FATE, EUROPE
0990 " MICROORGANISMS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, TOXICITY, SEDIMENTS

1058 PETROLEUM PRODUCTS, OIL TRANSFER, OIL TERMINALS, LEAKAGE, HYDROCARBONS , CRUDE OIL, POLLUTION CONTROL, TANKERS
1073 " GROUNDWATER, CONTAMINATION, POLLUTION CONTROL, SOURCES, STORAGE, PIPELINES, REGULATIONS
1086 " OIL-WATER SEPARATION, GUIDELINES, COST ANALYSIS, REFINERIES, WASTEWATERS, POLLUTION PREVENTION
0684 PHYSICAL ASPECTS, OIL SLICKS, DETECTION, CRUDE OIL, SEA SURFACE, *CAPACITANCE, *LASER REFLECTANCE
0701 " PERFORMANCE TESTING, OIL SPILLS, CANADA, BEHAVIOR, REMOTE SENSING, SEA SURFACE
0714 " PETROLEUM PRODUCTS, EVAPORATION, CHEMICAL ANALYSIS, TOXICITY
0917 " OCS, MODELS, MARINE ENVIRONMENT, BEHAVIOR, BASELINE STUDIES, ATLANTIC OCEAN, PREDICTIONS
0976 " MEDITERRANEAN SEA, FATE, AROMATIC HYDROCARBONS, WASTE OIL, TAR
R070 " OIL SPILLS, CRUDE OIL, REMOTE SENSING, WEATHERING, SOURCE IDENTIFICATION
0926 PHYSICAL EFFECTS, ENVIRONMENTAL EFFECTS, CRUDE OIL, CHEMICAL EFFECTS, ALASKA , SOIL, SUBARCTIC REGIONS, *TUNDRA
0930 " MORTALITY, CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, ALASKA , SOIL, PLANTS, RECOVERY, *BLACK SPRUCE, *TUNDRA
0935 " FUNGI, FATE, CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, SOIL, PLANTS, *TUNDRA
0937 " OIL SPILLS, INTERTIDAL ZONE, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, *EXPERIMENTAL DESIGN
0974 " MARINE ENVIRONMENT, HYDROCARBONS , CONCENTRATIONS, SEA SURFACE, SAMPLING, SOURCES, *ATMOSPHERIC INPUTS
1009 " OFFSHORE, LOUISIANA, DRILLING, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, PRODUCTION, *OFFSHORE ECOLOGY INVESTIGATION
0733 PHYTOPLANKTON, HYDROCARBONS , CONTAMINATION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SEAWATER, USSR
0839 " MARINE ENVIRONMENT, HYDROCARBONS , BIOMASS, BIOLOGICAL EFFECTS, *GUFEX
0866 " LAKES , FRESHWATER, CRUDE OIL, BIOLOGICAL EFFECTS, ARCTIC
1052 PIPELINES, ALASKA , SOCIOECONOMIC EFFECTS, TRANS-ALASKA PIPELINE
1053 " PATENT, MONITORING, LEAKAGE, EQUIPMENT, DETECTION, DESIGN-ENGINEERING, REFINERIES
1054 " NORTH SEA, MONITORING, LEAKAGE, EQUIPMENT, DETECTION, UK
1055 " PATENT, LEAKAGE, EQUIPMENT, DETECTION, DESIGN-ENGINEERING
1073 " PETROLEUM PRODUCTS, GROUNDWATER, CONTAMINATION, POLLUTION CONTROL, SOURCES, STORAGE, REGULATIONS
0726 PLANKTON, OIL DISCHARGES, OFFSHORE, GULF OF MEXICO, CONCENTRATIONS, BIOGENIC HYDROCARBONS, SAMPLING, *BUCCANEER OILFIELD, *ALKANES
0795 PLANTS, GROWTH, ENVIRONMENTAL EFFECTS, CRUDE OIL, BURNING, ALASKA , SOIL, RECOVERY
0837 " CRUDE OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, *SALIX ROTUNDIFOLIA
0861 " CRUDE OIL, BIOLOGICAL EFFECTS, SOIL, *SALIX ROTUNDIFOLIA
0862 " HYDROCARBONS , SUBLETHAL EFFECTS, *PHOTOSYNTHESIS
0883 " PETROCHEMICALS, CONTAMINATION, ANIMALS
0888 " CRUDE OIL, CONTINGENCY PLANNING, BIOLOGICAL EFFECTS, ALASKA , TOXICITY, RECOVERY, *DIESEL OIL
0930 " PHYSICAL EFFECTS, MORTALITY, CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, ALASKA , SOIL, RECOVERY, *BLACK SPRUCE, *TUNDRA
0932 " OIL SPILLS, INVERTEBRATES, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, REMOTE SENSING, *MANGROVE FORESTS
0934 " FUNGI, FATE, ENVIRONMENTAL EFFECTS, CRUDE OIL, CHRONIC EFFECTS, BACTERIA, ARCTIC, SOIL, *TUNDRA
0935 " PHYSICAL EFFECTS, FUNGI, FATE, CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, SOIL, *TUNDRA
0959 " CRUDE OIL, BIOLOGICAL EFFECTS, BIODEGRADATION, ALASKA , SOIL
0969 " LAND SPILLS, BIODEGRADATION, SOIL, TOXICITY
0727 PLATFORMS, OIL DISCHARGES, OFFSHORE, HYDROCARBONS , GULF OF MEXICO, CONCENTRATIONS, SAMPLING, *BUCCANEER OILFIELD, *ALKANES
0995 " OFFSHORE, MICROORGANISMS, MARINE ENVIRONMENT, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL, SEDIMENTS
1008 " OCS, LOUISIANA, GULF OF MEXICO, DRILLING, CHRONIC EFFECTS, BLM, PRODUCTION
0682 POLLUTION CONTROL, HYDROCARBONS , DETECTION, DESIGN-ENGINEERING, BACTERIA, SHIPS, *ENZYME ELECTRODE
0699 " FRANCE, COASTAL WATERS, REMOTE SENSING, SURVEILLANCE
0704 " COASTAL WATERS, REMOTE SENSING, SURVEILLANCE, USCG
0764 " PERFORMANCE TESTING, NEW YORK, DISPERSANTS, BIODEGRADATION, SPILL CLEANUP, SHIPS, *COREXIT 9527
0768 " OCEANS, FRANCE, DESIGN-ENGINEERING, SHIPS, SPILL CLEANUP
0790 " PATENT, OXIDATION, BIOLOGICAL TREATMENT, OIL REMOVAL, SEDIMENTS
0798 " ABSORPTION, SPILL REMOVAL, SORBENTS,*CEDAR WASTE
0806 " PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, *TOWED PLANING SLED
0809 " OIL INDUSTRY, DELAWARE, SPILL COOPERATIVES, SPILL RESPONSE, POLLUTION PREVENTION, RIVERS
0826 " EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, SPILL CLEANUP, SPILL RESPONSE, UK
0832 " OIL SHALE, MONITORING, EPA, CONTAMINATION, CHEMICAL ANALYSIS, SAMPLING

0833 POLLUTION CONTROL, OIL WELLS, DRILLING, BLOWOUTS
0868 " MICROORGANISMS, HEALTH HAZARDS, BIODEGRADATION
0922 " MONITORING, HEALTH HAZARDS, FATE, DEVELOPMENT, BEHAVIOR, ANALYTICAL TECHNIQUES,ENVIRONMENTAL EFFECTS, REFINERIES, WASTEWATERS, *PROCEEDINGS
0931 " OIL TRANSPORT, LEGISLATION, EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, BEHAVIOR, SPILL RESPONSE, POLLUTION PREVENTION, *CONFERENCE
0944 " PETROLEUM PRODUCTS, OIL SHALE, INDUSTRIES, EXTRACTION, ENVIRONMENTAL EFFECTS, BALTIC SEA, PRODUCTION, DISCHARGES
0945 " OIL SPILLS, EPA, ENVIRONMENTAL EFFECTS, POLLUTION PREVENTION, SPILL CLEANUP, *RESEARCH SUMMARY
0947 " MODELS, LEGISLATION, FATE, ENVIRONMENTAL EFFECTS, COST ANALYSIS, SOURCES, RESOURCE MANAGEMENT
1028 " BLOWOUTS, SPILL RESPONSE, SPILL CONTAINMENT, MEXICO, *IXTOC 1 BLOWOUT
1039 " FISHERIES, DISPERSANTS, BIOLOGICAL EFFECTS, SPILL RESPONSE, WILDLIFE, UK, *CHRISTOS BITAS SPILL
1049 " OIL TRANSPORT, TANKERS, SAFETY
1058 " PETROLEUM PRODUCTS, OIL TRANSFER, OIL TERMINALS, LEAKAGE, HYDROCARBONS , CRUDE OIL, TANKERS
1063 " OIL DISCHARGES, TANKERS, REGULATIONS, US, USCG, SEGREGATED BALLAST, WASTEWATERS, PORTS
1068 " LIABILITY, IMCO, INTERNATIONAL CONVENTION, SAFETY, TANKERS, *LAW OF THE SEA
1073 " PIPELINES, PETROLEUM PRODUCTS, GROUNDWATER, CONTAMINATION, SOURCES, STORAGE, REGULATIONS
1081 " FLOTATION, FLOCCULATION, BIBLIOGRAPHIES, WASTEWATER TREATMENT, REFINERIES, *COAGULATION
1082 " HYDROCARBONS , WASTEWATER TREATMENT, SORBENTS, *HYDROPHOBIC MATERIAL
1113 " OIL INDUSTRY, ECONOMIC EFFECTS, COST ANALYSIS, REFINERIES
0748 POLLUTION PREVENTION, OIL TRANSFER, EQUIPMENT, SOURCE IDENTIFICATION
0809 " POLLUTION CONTROL, OIL INDUSTRY, DELAWARE, SPILL COOPERATIVES, SPILL RESPONSE, RIVERS
0814 " FUEL OIL, DISPERSANTS, CONTINGENCY PLANNING, BEACH CLEANUP, SPILL RESPONSE, TANKERS
0819 " OFFSHORE, INTERNATIONAL AGREEMENTS, GREENLAND, DENMARK, CANADA, SPILL CLEANUP
0820 " MARINE ENVIRONMENT, LEGISLATION, REGULATIONS
0823 " OIL TRANSPORT, USCG, REGULATIONS, TANKERS
0824 " LAKES , FISHERIES, *LAKE MARACAIBO
0827 " OFFSHORE, NORTH SEA, MEDITERRANEAN SEA, EQUIPMENT, DRILLING, BLOWOUT PREVENTION
0828 " OIL TRANSPORT, OIL INDUSTRY, EXPLORATION, EUROPE, PRODUCTION, REFINING
0829 " OIL WELLS, OFFSHORE, EQUIPMENT, DRILLING, DESIGN-ENGINEERING, BLOWOUT PREVENTION, SAFETY
0830 " JAPAN, INTERNATIONAL AGREEMENTS, COMPENSATION, SOURCES, REGULATIONS
0931 " POLLUTION CONTROL, OIL TRANSPORT, LEGISLATION, EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, BEHAVIOR, SPILL RESPONSE, *CONFERENCE
0945 " POLLUTION CONTROL, OIL SPILLS, EPA, ENVIRONMENTAL EFFECTS, SPILL CLEANUP, *RESEARCH SUMMARY
1034 " INTERNATIONAL CONVENTIONS, IMCO, TANKERS, SHIPS, SEGREGATED BALLAST
1035 " INTERNATIONAL CONVENTIONS, IMCO, CRUDE OIL WASHING, TANKERS, SAFETY, SEGREGATED BALLAST, STATISTICS
1037 " PERSONNEL TRAINING, OIL SPILLS, BALLAST , TANKERS, SAFETY
1040 " DEEPWATER PORTS, ALASKA , TANKERS, SAFETY, *VALDEZ NARROWS
1042 " PERSONNEL TRAINING, API, TANKERS, SAFETY, REGULATIONS
1048 " PERFORMANCE TESTING, DESIGN-ENGINEERING, TANKERS, *SINKING TESTS
1051 " IMCO, CRUDE OIL WASHING, TANKERS
1059 " OIL TRANSFER, EQUIPMENT, TANKERS
1069 " OIL TRANSFER, GUIDELINES, GASOLINE, ECONOMICS, COST ANALYSIS, REGULATIONS
1071 " OIL TRANSPORT, ENVIRONMENTAL EFFECTS, ALASKA , TANKERS, TRANS-ALASKA PIPELINE
1072 " OIL TRANSPORT, OIL TRANSFER, DELAWARE BAY, SAFETY, TANKERS, REGULATIONS
1086 " PETROLEUM PRODUCTS, OIL-WATER SEPARATION, GUIDELINES, COST ANALYSIS, REFINERIES, WASTEWATERS
1102 " OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING
R084 " FUEL OIL, EQUIPMENT, WASTEWATER TREATMENT
0908 PORTS , OIL TRANSPORT, HYDROCARBONS , CHROMATOGRAPHY, BASELINE STUDIES, PUGET SOUND
1043 " OCS, DEVELOPMENT, TANKERS, SHIPS
1063 " POLLUTION CONTROL, OIL DISCHARGES, TANKERS, REGULATIONS, US, USCG, SEGREGATED BALLAST, WASTEWATERS
0917 PREDICTIONS, PHYSICAL ASPECTS, OCS, MODELS, MARINE ENVIRONMENT, BEHAVIOR, BASELINE STUDIES, ATLANTIC OCEAN
0977 " MOVEMENT, MODELS, GREENLAND, SPILL TRAJECTORIES, *DAVIS STRAIT
0980 " OIL SLICKS, MOVEMENT, MODELS, SPILL TRAJECTORIES
0984 " OIL SPILLS, MODELS, INFORMATION SYSTEMS, CANADA, STATISTICS
0762 PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, SHIPS
0765 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, OIL REMOVAL, SKIMMERS, SHIPS, TANKERS
0780 " PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, UK, *INVICTACAT
0828 PRODUCTION, POLLUTION PREVENTION, OIL TRANSPORT, OIL INDUSTRY, EXPLORATION, EUROPE, REFINING

0944 PRODUCTION, POLLUTION CONTROL, PETROLEUM PRODUCTS, OIL SHALE, INDUSTRIES, EXTRACTION, ENVIRONMENTAL EFFECTS, BALTIC SEA, DISCHARGES
1007 " OIL-GAS LEASING, OFFSHORE, ENVIRONMENTAL EFFECTS, DRILLING, SAFETY
1008 " PLATFORMS, OCS, LOUISIANA, GULF OF MEXICO, DRILLING, CHRONIC EFFECTS, BLM
1009 " PHYSICAL EFFECTS, OFFSHORE, LOUISIANA, DRILLING, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, *OFFSHORE ECOLOGY INVESTIGATION
1027 " OIL TRANSPORT, OFFSHORE, OCS, INTERNATIONAL AGREEMENTS, DEVELOPMENT, TANKERS, REFINING, *CHINA SEA, *MARINE REGIONALISM
0908 PUGET SOUND, PORTS , OIL TRANSPORT, HYDROCARBONS , CHROMATOGRAPHY, BASELINE STUDIES
0913 " MARINE ORGANISMS, FOOD WEB, FISH, BASELINE STUDIES, *STRAIGHT OF JUAN DE FUCA
1078 RECLAMATION, PATENT, LUBRICATING OIL, WASTE OIL TREATMENT
1106 " RECYCLING, WASTE OIL TREATMENT
1107 " LUBRICATING OIL, HYDROCARBONS , CRANKCASE OIL, CHROMATOGRAPHY, CHEMICAL ANALYSIS, WASTE OIL, US
1108 " LEGISLATION, HEALTH HAZARDS, EUROPE, ENVIRONMENTAL EFFECTS, CRANKCASE OIL, WASTE OIL, DISPOSAL, RECYCLING, US, STATE GOVERNMENTS
1109 " PATENT, LUBRICATING OIL, *FE-CONTAMINATED OILS
1110 " LUBRICATING OIL, ENVIRONMENTAL EFFECTS, REFINING, RECYCLING, WASTE OIL
0795 RECOVERY, PLANTS, GROWTH, ENVIRONMENTAL EFFECTS, CRUDE OIL, BURNING, ALASKA , SOIL
0877 " MARINE ORGANISMS, HYDROCARBONS , ALASKA , ACUTE EFFECTS, WSF, TOXICITY, SUBLETHAL EFFECTS
0888 " PLANTS, CRUDE OIL, CONTINGENCY PLANNING, BIOLOGICAL EFFECTS, ALASKA , TOXICITY, *DIESEL OIL
0895 " CRUDE OIL, CHRONIC EFFECTS, ALASKA , VEGETATION, SOIL, TOXICITY, *TUNDRA
0924 " MASSACHUSETTS, MARSHES, FUEL OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, TOXICITY, SEDIMENTS, *FUNDULUS
0930 " PLANTS, PHYSICAL EFFECTS, MORTALITY, CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, ALASKA , SOIL, *BLACK SPRUCE, *TUNDRA
0936 " OIL SPILLS, ENVIRONMENTAL EFFECTS, CHRONIC EFFECTS, AFRICA, TANKERS, *VENPET-VENOIL SPILL
0964 " HYDROCARBONS , FRANCE, CHRONIC EFFECTS, BIODEGRADATION, BEACHES, REFINERIES, WASTEWATERS
1106 RECYCLING, RECLAMATION, WASTE OIL TREATMENT
1108 " RECLAMATION, LEGISLATION, HEALTH HAZARDS, EUROPE, ENVIRONMENTAL EFFECTS, CRANKCASE OIL, WASTE OIL, DISPOSAL, US, STATE GOVERNMENTS
1110 " RECLAMATION, LUBRICATING OIL, ENVIRONMENTAL EFFECTS, REFINING, WASTE OIL
R085 " PERFORMANCE TESTING, EQUIPMENT, WASTEWATER TREATMENT, *MICRO-GAS-DISPERSION STRIPPING
1114 RED SEA, OIL SPILLS, ISRAEL, RESOURCE MANAGEMENT
0685 REFINERIES, HYDROCARBONS , DETECTION, ANALYTICAL TECHNIQUES, *PROCEEDINGS
0881 " FISH, BIOINDICATORS, BIOASSAY, SUBLETHAL EFFECTS, TOXICITY, WASTEWATERS
0922 " POLLUTION CONTROL, MONITORING, HEALTH HAZARDS, FATE, DEVELOPMENT, BEHAVIOR, ANALYTICAL TECHNIQUES,ENVIRONMENTAL EFFECTS, WASTEWATERS, *PROCEEDINGS
0964 " RECOVERY, HYDROCARBONS , FRANCE, CHRONIC EFFECTS, BIODEGRADATION, BEACHES, WASTEWATERS
0999 " HYDROCARBONS , FATE, DISTRIBUTION, SOURCES, WASTEWATERS, *PERSISTENCE
1053 " PIPELINES, PATENT, MONITORING, LEAKAGE, EQUIPMENT, DETECTION, DESIGN-ENGINEERING
1077 " PETROCHEMICALS, EQUIPMENT, WASTE OIL TREATMENT, SLUDGES, USSR
1080 " EUROPE, WASTEWATER TREATMENT, STATISTICS
1081 " POLLUTION CONTROL, FLOTATION, FLOCCULATION, BIBLIOGRAPHIES, WASTEWATER TREATMENT, *COAGULATION
1086 " POLLUTION PREVENTION, PETROLEUM PRODUCTS, OIL-WATER SEPARATION, GUIDELINES, COST ANALYSIS, WASTEWATERS
1088 " PETROCHEMICALS, LAND FARMING, SLUDGE, DISPOSAL
1113 " POLLUTION CONTROL, OIL INDUSTRY, ECONOMIC EFFECTS, COST ANALYSIS
0735 REFINING, MONITORING, CONTAMINATION, ANALYTICAL TECHNIQUES, WASTEWATERS, *ENZYME INHIBITION SCREENING
0828 " PRODUCTION, POLLUTION PREVENTION, OIL TRANSPORT, OIL INDUSTRY, EXPLORATION, EUROPE
1027 " PRODUCTION, OIL TRANSPORT, OFFSHORE, OCS, INTERNATIONAL AGREEMENTS, DEVELOPMENT, TANKERS, *CHINA SEA, *MARINE REGIONALISM
1029 " MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS, WASTEWATERS
1075 " EXTRACTION, WASTEWATER TREATMENT
1083 " WASTE OIL TREATMENT, STATISTICS, REUSE
1110 " RECYCLING, RECLAMATION, LUBRICATING OIL, ENVIRONMENTAL EFFECTS, WASTE OIL
0818 REGULATIONS, LIABILITY, LEGISLATION, INSURANCE, EPA, SPILL CLEANUP, SPILL REMOVAL, *SUPERFUND
0820 " POLLUTION PREVENTION, MARINE ENVIRONMENT, LEGISLATION
0821 " INTERNATIONAL CONVENTIONS, USCG, TANKERS, SAFETY
0822 " OIL-WATER SEPARATION, OIL DISCHARGES, IMCO, EQUIPMENT, TANKERS, USCG
0823 " POLLUTION PREVENTION, OIL TRANSPORT, USCG, TANKERS
0830 " POLLUTION PREVENTION, JAPAN, INTERNATIONAL AGREEMENTS, COMPENSATION, SOURCES
1002 " OIL INDUSTRY, NORWAY, LEGISLATION, COMPENSATION, SOLID WASTES
1003 " OIL-GAS LEASING, OFFSHORE, OCS, GOVERNMENT AGENCIES, DEVELOPMENT, *US FISH & WILDLIFE SERVICE
1004 " OIL INDUSTRY, GUIDELINES, EUROPE, ENVIRONMENTAL EFFECTS, STATISTICS

1005 REGULATIONS, OIL-GAS LEASING, OCS, LEGISLATION, DEVELOPMENT, COASTAL ZONE MANAGEMENT, RESOURCE MANAGEMENT, *PUBLIC PARTICIPATION
1012 " OIL SHALE, GROUNDWATER, ENVIRONMENTAL EFFECTS, BIBLIOGRAPHIES, RESOURCE MANAGEMENT, WASTEWATERS, COLORADO
1031 " OIL TRANSPORT, LIABILITY, LAW ENFORCEMENT, INTERNATIONAL AGREEMENTS, IMCO, TANKERS, SAFETY
1032 " OIL DISCHARGES, MORTALITY, MARINE ORGANISMS, INTERNATIONAL AGREEMENTS, SPILL RESPONSE
1041 " OIL TRANSPORT, MONITORING, INTERNATIONAL AGREEMENTS, ENGLISH CHANNEL, TANKERS, SAFETY
1042 " POLLUTION PREVENTION, PERSONNEL TRAINING, API, TANKERS, SAFETY
1044 " GUIDELINES, TANKERS, SHIPS, SAFETY, USCG
1045 " OIL TRANSPORT, EQUIPMENT, DESIGN-ENGINEERING, TANKERS, SEGREGATED BALLAST
1046 " OIL DISCHARGES, BALLAST , TANKERS, STATISTICS, SOURCES, *ACCIDENTS
1063 " PORTS , POLLUTION CONTROL, OIL DISCHARGES, TANKERS, US, USCG, SEGREGATED BALLAST, WASTEWATERS
1064 " OIL TRANSPORT, LIABILITY, LEGISLATION, INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, TANKERS, SHIPS, *LAW OF THE SEA
1065 " PERSONNEL TRAINING, OIL SPILLS, SAFETY, TANKERS
1066 " OIL TRANSPORT, COASTAL ZONE MANAGEMENT
1069 " POLLUTION PREVENTION, OIL TRANSFER, GUIDELINES, GASOLINE, ECONOMICS, COST ANALYSIS
1072 " POLLUTION PREVENTION, OIL TRANSPORT, OIL TRANSFER, DELAWARE BAY, SAFETY, TANKERS
1073 " POLLUTION CONTROL, PIPELINES, PETROLEUM PRODUCTS, GROUNDWATER, CONTAMINATION, SOURCES, STORAGE
1111 " OIL INDUSTRY, LEGISLATION, EPA, SOLID WASTES
1115 " OIL-GAS LEASING, OFFSHORE, INFORMATION SYSTEMS, EXPLORATION
0687 REMOTE SENSING, OIL SPILLS, MOVEMENT, MONITORING, MODELS, DETECTION
0694 " DETECTION, USCG, SURVEILLANCE, *RADAR SYSTEM
0695 " OIL SLICKS, MONITORING, DETECTION, TANKERS, SHIPS, SWEDEN
0696 " OIL SLICKS, MONITORING, HYDROCARBONS , DETECTION, *PROCEEDINGS
0697 " MONITORING, DETECTION, ANALYTICAL TECHNIQUES, *AIRBORNE LASER
0698 " MONITORING, DETECTION, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, *SPECTRAL SIGNATURES
0699 " POLLUTION CONTROL, FRANCE, COASTAL WATERS, SURVEILLANCE
0700 " MODELS, DETECTION, SEA SURFACE
0701 " PHYSICAL ASPECTS, PERFORMANCE TESTING, OIL SPILLS, CANADA, BEHAVIOR, SEA SURFACE
0702 " OIL SPILLS, DETECTION, SURVEILLANCE
0703 " MOVEMENT, MONITORING, GREAT LAKES, DETECTION, *LANDSAT, *ERTS
0704 " POLLUTION CONTROL, COASTAL WATERS, SURVEILLANCE, USCG
0932 " PLANTS, OIL SPILLS, INVERTEBRATES, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, *MANGROVE FORESTS
R070 " PHYSICAL ASPECTS, OIL SPILLS, CRUDE OIL, WEATHERING, SOURCE IDENTIFICATION
R071 " PERFORMANCE TESTING, OIL SPILLS, DETECTION, SANTA BARBARA CHANNEL, *IR
0842 REPRODUCTION, MORTALITY, FUEL OIL, BIRDS, BIOLOGICAL EFFECTS, CHONIC EFFECTS, *LARUS MARINUS
0850 " GROWTH, CRUDE OIL, CHRONIC EFFECTS, BIRDS
0857 " GROWTH, FUEL OIL, CRUSTACEANS, SUBLETHAL EFFECTS, WSF
0885 " MORTALITY, BIOLOGICAL EFFECTS, WSF, TOXICITY, SUBLETHAL EFFECTS, *COPEPOD, *NITOCRA AFFINIS
0889 " MORTALITY, FUEL OIL, BIRDS, BIOLOGICAL EFFECTS, TOXICITY
0688 RESOURCE MANAGEMENT, OIL SPILLS, MONITORING, INTERNATIONAL AGREEMENTS, CONTINGENCY PLANNING, *IGOSS
0919 " GOVERNMENT AGENCIES, CONTAMINATION, CANADA, BIRDS, BIOLOGICAL EFFECTS
0947 " POLLUTION CONTROL, MODELS, LEGISLATION, FATE, ENVIRONMENTAL EFFECTS, COST ANALYSIS, SOURCES
1005 " REGULATIONS, OIL-GAS LEASING, OCS, LEGISLATION, DEVELOPMENT, COASTAL ZONE MANAGEMENT, *PUBLIC PARTICIPATION
1006 " OIL INDUSTRY, OFFSHORE, NORTH SEA, FISHERIES, DEVELOPMENT, UK
1011 " OIL SHALE, MODELS, ENVIRONMENTAL EFFECTS, REGULATION, WASTEWATERS, COLORADO
1012 " REGULATIONS, OIL SHALE, GROUNDWATER, ENVIRONMENTAL EFFECTS, BIBLIOGRAPHIES, WASTEWATERS, COLORADO
1015 " OIL SPILLS, TRANS-ALASKA PIPELINE
1024 " MODELS, MARINE MAMMALS, ECOSYSTEMS, ARCTIC
1030 " OIL INDUSTRY, LOUISIANA, DEVELOPMENT, BASELINE STUDIES
1114 " RED SEA, OIL SPILLS, ISRAEL
1083 REUSE, REFINING, WASTE OIL TREATMENT, STATISTICS
0928 RISK ANALYSIS, OIL SHALE, FOSSIL FUELS, ENVIRONMENTAL EFFECTS
0940 " HARBORS, CONTAMINATION, BIBLIOGRAPHIES, LITERATURE REVIEW
0982 " OCS, MODELS, SPILL TRAJECTORIES, USGS
1010 " LIABILITY, ENVIRONMENTAL EFFECTS, DRILLING, DEVELOPMENT, CANADA, ARCTIC, WILDLIFE, *LANCASTER SOUND
1047 " OIL TRANSPORT, ECONOMICS, DESIGN-ENGINEERING, ARCTIC, TANKERS, *SUBMARINE TANKERS
0809 RIVERS, POLLUTION PREVENTION, POLLUTION CONTROL, OIL INDUSTRY, DELAWARE, SPILL COOPERATIVES, SPILL RESPONSE

0838 RIVERS, OIL SPILLS, MORTALITY, INVERTEBRATES, FRESHWATER, CANADA, BENTHOS, TAR SANDS, SLUDGE , TOXICITY
0958 " HYDROCARBONS , FRESHWATER, BIODEGRADATION, BACTERIA, *ARTHROBACTER SP.
0993 " NARRAGANSETT BAY, HYDROCARBONS , CONCENTRATIONS, BAYS, SAMPLING, CHEMICAL ANALYSIS, SEDIMENTS
1099 " HEALTH HAZARDS, FLORIDA, EPA, WASTEWATER TREATMENT
R081 " MOVEMENT, MODELS, DISPERSION, SPILL TRAJECTORIES
0821 SAFETY, REGULATIONS, INTERNATIONAL CONVENTIONS, USCG, TANKERS
0829 " POLLUTION PREVENTION, OIL WELLS, OFFSHORE, EQUIPMENT, DRILLING, DESIGN-ENGINEERING, BLOWOUT PREVENTION
0998 " OIL SPILLS, OFFSHORE, MODELS, ICE, GREENLAND, DRILLING, DRIFT, *DAVIS STRAIT
1007 " PRODUCTION, OIL-GAS LEASING, OFFSHORE, ENVIRONMENTAL EFFECTS, DRILLING
1025 " OIL-GAS LEASING, OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, USCG
1031 " REGULATIONS, OIL TRANSPORT, LIABILITY, LAW ENFORCEMENT, INTERNATIONAL AGREEMENTS, IMCO, TANKERS
1035 " POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO, CRUDE OIL WASHING, TANKERS, SEGREGATED BALLAST, STATISTICS
1036 " TANKERS, *INERT GAS SYSTEMS
1037 " POLLUTION PREVENTION, PERSONNEL TRAINING, OIL SPILLS, BALLAST , TANKERS
1040 " POLLUTION PREVENTION, DEEPWATER PORTS, ALASKA , TANKERS, *VALDEZ NARROWS
1041 " REGULATIONS, OIL TRANSPORT, MONITORING, INTERNATIONAL AGREEMENTS, ENGLISH CHANNEL, TANKERS
1042 " REGULATIONS, POLLUTION PREVENTION, PERSONNEL TRAINING, API, TANKERS
1044 " REGULATIONS, GUIDELINES, TANKERS, SHIPS, USCG
1049 " POLLUTION CONTROL, OIL TRANSPORT, TANKERS
1065 " REGULATIONS, PERSONNEL TRAINING, OIL SPILLS, TANKERS
1068 " POLLUTION CONTROL, LIABILITY, IMCO, INTERNATIONAL CONVENTION, TANKERS, *LAW OF THE SEA
1072 " REGULATIONS, POLLUTION PREVENTION, OIL TRANSPORT, OIL TRANSFER, DELAWARE BAY, TANKERS
1116 " OIL INDUSTRY, HEALTH HAZARDS, *ACCIDENTS
0707 SAMPLING, PAH, FRESHWATER, DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, SEDIMENTS
0713 " DETECTION, ANALYTICAL TECHNIQUES, *OIL-IN-WATER ANALYSIS
0725 " HYDROCARBONS , GULF OF MEXICO, FISH, CONCENTRATIONS, ANALYTICAL TECHNIQUES, OFFSHORE, *BUCCANEER OILFIELD, *ALKANES
0726 " PLANKTON, OIL DISCHARGES, OFFSHORE, GULF OF MEXICO, CONCENTRATIONS, BIOGENIC HYDROCARBONS, *BUCCANEER OILFIELD, *ALKANES
0727 " PLATFORMS, OIL DISCHARGES, OFFSHORE, HYDROCARBONS , GULF OF MEXICO, CONCENTRATIONS, *BUCCANEER OILFIELD, *ALKANES
0728 " OIL DISCHARGES, OFFSHORE, GULF OF MEXICO, BIOGENIC HYDROCARBONS, SEDIMENTS, *BUCCANEER OILFIELD, *ALKANES
0736 " OFFSHORE, INDIA, HYDROCARBONS , CONCENTRATIONS, COASTAL WATERS
0737 " HYDROCARBONS , EQUIPMENT, DESIGN-ENGINEERING, SEAWATER
0740 " PETROLEUM PRODUCTS, HYDROCARBONS , CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, SOLUBILITY, *PARTITION COEFFICIENTS
0832 " POLLUTION CONTROL, OIL SHALE, MONITORING, EPA, CONTAMINATION, CHEMICAL ANALYSIS
0849 " MODELS, MARSHES, FUEL OIL, CRUDE OIL, SUBLETHAL EFFECTS
0960 " MICROORGANISMS, HYDROCARBONS , FUNGI, FUEL OIL, BIODEGRADATION, BALTIC SEA, BACTERIA, SEDIMENTS
0974 " PHYSICAL EFFECTS, MARINE ENVIRONMENT, HYDROCARBONS , CONCENTRATIONS, SEA SURFACE, SOURCES, *ATMOSPHERIC INPUTS
0993 " RIVERS, NARRAGANSETT BAY, HYDROCARBONS , CONCENTRATIONS, BAYS, CHEMICAL ANALYSIS, SEDIMENTS
0753 SANTA BARBARA CHANNEL, NATURAL SEEPAGE, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, SPECTROSCOPY, WEATHERING, *IR
0893 " ONSHORE IMPACTS, OIL SPILLS, ECONOMICS, COST ANALYSIS, SOCIOECONOMIC EFFECTS
1013 " OIL-GAS LEASING, OFFSHORE, OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CALIFORNIA
R071 " REMOTE SENSING, PERFORMANCE TESTING, OIL SPILLS, DETECTION, *IR
0801 SCOTLAND, OIL SPILLS, MORTALITY, ENVIRONMENTAL EFFECTS, BIRDS, ANIMALS, SPILL CLEANUP, *ESSO BERNICIA SPILL
0876 " MARINE ORGANISMS, INTERTIDAL ZONE, ENVIRONMENTAL EFFECTS, DISTRIBUTION, BENTHOS
0933 " OIL TERMINALS, OIL DISCHARGES, ENVIRONMENTAL EFFECTS, BEACHES, BALLAST , TANKERS, *SHETLAND ISLANDS
1056 " OIL TERMINALS, OIL SPILLS, FUEL OIL, ENVIRONMENTAL EFFECTS, SPILL RESPONSE, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1057 " OIL TERMINALS, CONTINGENCY PLANNING, SPILL RESPONSE, SPILL CLEANUP, TANKERS, *ESSO BERNICIA SPILL, *SULLOM VOE TERMINAL
1062 " OIL-WATER SEPARATION, OIL TERMINALS, OIL SPILLS, FUEL OIL, BIOLOGICAL EFFECTS, TANKERS, SURVEILLANCE, *SULLOM VOE TERMINAL
0684 SEA SURFACE, PHYSICAL ASPECTS, OIL SLICKS, DETECTION, CRUDE OIL, *CAPACITANCE, *LASER REFLECTANCE
0700 " REMOTE SENSING, MODELS, DETECTION
0701 " REMOTE SENSING, PHYSICAL ASPECTS, PERFORMANCE TESTING, OIL SPILLS, CANADA, BEHAVIOR
0769 " PATENT, DISPERSANTS, SURFACTANTS, SPILL CLEANUP

0974 SEA SURFACE, SAMPLING, PHYSICAL EFFECTS, MARINE ENVIRONMENT, HYDROCARBONS , CONCENTRATIONS, SOURCES, *ATMOSPHERIC INPUTS
0983 " OIL SLICKS, DRIFT, SPREADING
0986 " OIL SPILLS, MODELS, DRIFT, BEHAVIOR, SPILL TRAJECTORIES, PREDICITIONS
0733 SEAWATER, PHYTOPLANKTON, HYDROCARBONS , CONTAMINATION, CHROMATOGRAPHY, CHEMICAL ANALYSIS, USSR
0737 " SAMPLING, HYDROCARBONS , EQUIPMENT, DESIGN-ENGINEERING
0741 " FRESHWATER, CONCENTRATIONS, CHEMICAL ANALYSIS, SEDIMENTS
0742 " PAH, NATURAL SEEPAGE, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, SEDIMENTS, *HEADSPACE SAMPLING
R072 " ANALYTICAL TECHNIQUES, USN
R073 " HYDROCARBONS , CHEMICAL ANALYSIS, BENTHOS, SEDIMENT, *TRANSPORT
R080 " HYDROCARBONS , FATE, CHEMICAL ANALYSIS, SOLUBILITY
0825 SEDIMENTATION, OIL-GAS LEASING, OFFSHORE, NOAA, GULF OF MEXICO, DRILLING, DEVELOPMENT, CORAL REEFS, CONSERVATION, *MARINE SANCTUARY
0912 " OCS, HYDROCARBONS , DISTRIBUTION, BIOGENIC HYDROCARBONS, BEAUFORT SEA, BASELINE STUDIES, ALASKA
0707 SEDIMENTS, SAMPLING, PAH, FRESHWATER, DETECTION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES
0708 " HYDROCARBONS , ENVIRONMENTAL EFFECTS, DETECTION, CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS
0728 " SAMPLING, OIL DISCHARGES, OFFSHORE, GULF OF MEXICO, BIOGENIC HYDROCARBONS, *BUCCANEER OILFIELD, *ALKANES
0741 " SEAWATER, FRESHWATER, CONCENTRATIONS, CHEMICAL ANALYSIS
0742 " SEAWATER, PAH, NATURAL SEEPAGE, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY, *HEADSPACE SAMPLING
0790 " POLLUTION CONTROL, PATENT, OXIDATION, BIOLOGICAL TREATMENT, OIL REMOVAL
0836 " OCS, MARINE ORGANISMS, HYDROCARBONS , BENTHOS, ALASKA , UPTAKE, *DEPOSIT-FEEDERS
0851 " MICROORGANISMS, LAKES , GASOLINE, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, ARCTIC
0852 " MICROORGANISMS, LAKES , CRUDE OIL, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, TOXICITY
0891 " PETROLEUM PRODUCTS, MOVEMENT, HYDROCARBONS , FATE, ATLANTIC OCEAN, *NEW YORK BIGHT
0892 " PETROLEUM PRODUCTS, CONCENTRATIONS, WATER QUALITY, *DREDGING
0924 " RECOVERY, MASSACHUSETTS, MARSHES, FUEL OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, TOXICITY, *FUNDULUS
0960 " SAMPLING, MICROORGANISMS, HYDROCARBONS , FUNGI, FUEL OIL, BIODEGRADATION, BALTIC SEA, BACTERIA
0965 " HYDROCARBONS , COLD CLIMATES, BIODEGRADATION, BACTERIA
0967 " FATE, ARGO MERCHANT SPILL, ANALYTICAL TECHNIQUES, CHROMATOGRAHY, TAR
0971 " PAH, FATE, CRANKCASE OIL, *STORMWATER RUNOFF
0990 " PETROLEUM PRODUCTS, MICROORGANISMS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, TOXICITY
0993 " SAMPLING, RIVERS, NARRAGANSETT BAY, HYDROCARBONS , CONCENTRATIONS, BAYS, CHEMICAL ANALYSIS
0995 " PLATFORMS, OFFSHORE, MICROORGANISMS, MARINE ENVIRONMENT, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT, CRUDE OIL
R079 " MODELS, HYDROCARBONS , FATE, DISTRIBUTION, BERMUDA, TAR
1034 SEGREGATED BALLAST, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO, TANKERS, SHIPS
1035 " SAFETY, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO, CRUDE OIL WASHING, TANKERS, STATISTICS
1045 " REGULATIONS, OIL TRANSPORT, EQUIPMENT, DESIGN-ENGINEERING, TANKERS
1063 " REGULATIONS, PORTS , POLLUTION CONTROL, OIL DISCHARGES, TANKERS, US, USCG, WASTEWATERS
0682 SHIPS, POLLUTION CONTROL, HYDROCARBONS , DETECTION, DESIGN-ENGINEERING, BACTERIA, *ENZYME ELECTRODE
0695 " REMOTE SENSING, OIL SLICKS, MONITORING, DETECTION, TANKERS, SWEDEN
0761 " OIL-WATER SEPARATION, DESIGN-ENGINEERING, SPILL CLEANUP, SPILL REMOVAL, SKIMMERS
0762 " PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS
0764 " POLLUTION CONTROL, PERFORMANCE TESTING, NEW YORK, DISPERSANTS, BIODEGRADATION, SPILL CLEANUP, *COREXIT 9527
0765 " PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, OIL REMOVAL, SKIMMERS, TANKERS
0768 " POLLUTION CONTROL, OCEANS, FRANCE, DESIGN-ENGINEERING, SPILL CLEANUP
0772 " PATENT, EQUIPMENT, BOOMS, SPILL CLEANUP, DISIGN-ENGINEERING
0797 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, OIL REMOVAL
0799 " PATENT, OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS
0941 " OIL DISCHARGES, JAPAN, CONTAMINATION, COASTAL ZONE MANAGEMENT, COASTAL WATERS, TANKERS
1034 " SEGREGATED BALLAST, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO, TANKERS
1043 " PORTS , OCS, DEVELOPMENT, TANKERS
1044 " SAFETY, REGULATIONS, GUIDELINES, TANKERS, USCG
1050 " OIL SLICKS, OIL DISCHARGES, MONITORING, EQUIPMENT, BALLAST , TANKERS
1064 " REGULATIONS, OIL TRANSPORT, LIABILITY, LEGISLATION, INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, TANKERS, *LAW OF THE SEA
1101 " OIL-WATER SEPARATION, BALLAST , TANKERS

0761 SKIMMERS, SHIPS, OIL-WATER SEPARATION, DESIGN-ENGINEERING, SPILL CLEANUP, SPILL REMOVAL
0762 " SHIPS, PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP
0765 " SHIPS, PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, OIL REMOVAL, TANKERS
0767 " EQUIPMENT, AMOCO CADIZ SPILL, SPILL REMOVAL
0774 " PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, *OHMSETT
0778 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP
0785 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL
0793 " PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CLEANUP, *OHMSETT
0794 " PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CLEANUP, *OHMSETT
0796 " PATENT, DESIGN-ENGINEERING, SPILL CLEANUP
0799 " SHIPS, PATENT, OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP
0800 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL
0802 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP
0805 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL
0838 SLUDGE , RIVERS, OIL SPILLS, MORTALITY, INVERTEBRATES, FRESHWATER, CANADA, BENTHOS, TAR SANDS, TOXICITY
0812 SOCIOECONOMIC EFFECTS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, MEDITERRANEAN SEA
0893 " SANTA BARBARA CHANNEL, ONSHORE IMPACTS, OIL SPILLS, ECONOMICS, COST ANALYSIS
1000 " ONSHORE IMPACTS, OIL-GAS LEASING, OCS, COASTAL ZONE MANAGEMENT
1016 " OIL-GAS LEASING, OFFSHORE, OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT, ATLANTIC COAST
1022 " OIL SPILLS, KUWAIT, DEVELOPMENT, CRUDE OIL, SOLID WASTES
1026 " OIL-GAS LEASING, OFFSHORE, OCS, GEORGES BANK, ENVIRONMENTAL EFFECTS, DEVELOPMENT, *NEW ENGLAND
1052 " PIPELINES, ALASKA , TRANS-ALASKA PIPELINE
0720 SOIL, HYDROCARBONS , CHROMATOGRAPHY, CHEMICAL ANALYSIS
0795 " RECOVERY, PLANTS, GROWTH, ENVIRONMENTAL EFFECTS, CRUDE OIL, BURNING, ALASKA
0861 " PLANTS, CRUDE OIL, BIOLOGICAL EFFECTS, *SALIX ROTUNDIFOLIA
0680 " FUNGI, CRUDE OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, BACTERIA, ALASKA , YEASTS, TOXICITY, SUBARCTIC REGIONS
0695 " RECOVERY, CRUDE OIL, CHRONIC EFFECTS, ALASKA , VEGETATION, TOXICITY, *TUNDRA
0926 " PHYSICAL EFFECTS, ENVIRONMENTAL EFFECTS, CRUDE OIL, CHEMICAL EFFECTS, ALASKA , SUBARCTIC REGIONS, *TUNDRA
0930 " RECOVERY, PLANTS, PHYSICAL EFFECTS, MORTALITY, CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, ALASKA , *BLACK SPRUCE, *TUNDRA
0934 " PLANTS, FUNGI, FATE, ENVIRONMENTAL EFFECTS, CRUDE OIL, CHRONIC EFFECTS, BACTERIA, ARCTIC, *TUNDRA
0935 " PLANTS, PHYSICAL EFFECTS, FUNGI, FATE, CRUDE OIL, CHRONIC EFFECTS, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC, *TUNDRA
0951 " CRUDE OIL, BIODEGRADATION, SLUDGE
0959 " PLANTS, CRUDE OIL, BIOLOGICAL EFFECTS, BIODEGRADATION, ALASKA
0966 " MICROORGANISMS, GROUNDWATER, BIODEGRADATION
0969 " PLANTS, LAND SPILLS, BIODEGRADATION, TOXICITY
0994 " FUEL OIL, FATE, CRUDE OIL, ALASKA , BIODEGRATION, SUBARCTIC REGIONS
1002 SOLID WASTES, REGULATIONS, OIL INDUSTRY, NORWAY, LEGISLATION, COMPENSATION
1022 " SOCIOECONOMIC EFFECTS, OIL SPILLS, KUWAIT, DEVELOPMENT, CRUDE OIL
1091 " OIL SHALE, BIBLIOGRAPHIES, WASTEWATERS, DISPOSAL
1111 " REGULATIONS, OIL INDUSTRY, LEGISLATION, EPA
0740 SOLUBILITY, SAMPLING, PETROLEUM PRODUCTS, HYDROCARBONS , CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, *PARTITION COEFFICIENTS
R080 " SEAWATER, HYDROCARBONS , FATE, CHEMICAL ANALYSIS
0770 SORBENTS, OIL TANKS, ICE, COLD CLIMATES, ALASKA , SPILL REMOVAL, SPILL CLEANUP
0781 " OIL-WATER SEPARATION, AROMATIC HYDROCARBONS, ADSORPTION
0798 " POLLUTION CONTROL, ABSORPTION, SPILL REMOVAL,*CEDAR WASTE
0803 " PATENT, EMULSIONS, ADSORPTION, SPILL CLEANUP
1082 " POLLUTION CONTROL, HYDROCARBONS , WASTEWATER TREATMENT, *HYDROPHOBIC MATERIAL
1087 " PATENT, OIL SLICKS, ADSORPTION, WASTEWATER TREATMENT
1100 " PATENT, OIL-WATER SEPARATION, FILTRATION
0698 SOURCE IDENTIFICATION, REMOTE SENSING, MONITORING, DETECTION, ANALYTICAL TECHNIQUES, *SPECTRAL SIGNATURES
0709 " OIL SPILLS, NORWAY, ANALYTICAL TECHNIQUES, SOURCES
0717 " HYDROCARBONS , DISPERSION, ANALYTICAL TECHNIQUES
0719 " HYDROCARBONS , CHROMATOGRAPHY, CHEMICAL ANALYSIS, TAR
0739 " OIL SPILLS, ANALYTICAL TECHNIQUES, *MULTICOMPONENT FLUORESCENCE
0745 " LAW ENFORCEMENT, EPA, CHEMICAL ANALYSIS, WEATHERING
0746 " HYDROCARBONS , DISTRIBUTION, CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS, *ALKANES
0747 " OIL SPILLS, MODELS, INFORMATION SYSTEMS, ANALYTICAL TECHNIQUES, *PATTERN RECOGNITION
0748 " POLLUTION PREVENTION, OIL TRANSFER, EQUIPMENT
0749 " ANALYTICAL TECHNIQUES, WEATHERING, USCG
0750 " ANALYTICAL TECHNIQUES, *LUMINESCENCE
0751 " OIL SLICKS, NATURAL SEEPAGE, CHEMICAL ANALYSIS, CANADA, ARCTIC
0752 " LIABILITY, LAW ENFORCEMENT, CHEMICAL ANALYSIS
0753 " SANTA BARBARA CHANNEL, NATURAL SEEPAGE, CHEMICAL ANALYSIS, SPECTROSCOPY, WEATHERING, *IR

R070 SOURCE IDENTIFICATION, REMOTE SENSING, PHYSICAL ASPECTS, OIL SPILLS, CRUDE OIL, WEATHERING
0705 SOURCES, HYDROCARBONS , CHROMATOGRAPHY, CHEMICAL ANALYSIS, SPECTROMETRY
0709 " SOURCE IDENTIFICATION, OIL SPILLS, NORWAY, ANALYTICAL TECHNIQUES
0830 " REGULATIONS, POLLUTION PREVENTION, JAPAN, INTERNATIONAL AGREEMENTS, COMPENSATION
0874 " PETROLEUM PRODUCTS, FISH, DELAWARE BAY, CRUDE OIL, BIOLOGICAL EFFECTS, TOXICITY, SHELLFISH, *URBAN RUNOFF
0929 " MARINE ENVIRONMENT, FRESHWATER, FATE, BIOLOGICAL EFFECTS, ANALYTICAL TECHNIQUES, *PROCEEDINGS
0947 " RESOURCE MANAGEMENT, POLLUTION CONTROL, MODELS, LEGISLATION, FATE, ENVIRONMENTAL EFFECTS, COST ANALYSIS
0974 " SEA SURFACE, SAMPLING, PHYSICAL EFFECTS, MARINE ENVIRONMENT, HYDROCARBONS , CONCENTRATIONS, *ATMOSPHERIC INPUTS
0992 " OIL TRANSPORT, OIL INDUSTRY, NORTH SEA, DISTRIBUTION, STATISTICS, TAR
0999 " REFINERIES, HYDROCARBONS , FATE, DISTRIBUTION, WASTEWATERS, *PERSISTENCE
1018 " FISHERIES, FATE, ENVIRONMENTAL EFFECTS, COASTAL ZONE MANAGEMENT
1046 " REGULATIONS, OIL DISCHARGES, BALLAST , TANKERS, STATISTICS, *ACCIDENTS
1073 " REGULATIONS, POLLUTION CONTROL, PIPELINES, PETROLEUM PRODUCTS, GROUNDWATER, CONTAMINATION, STORAGE
1112 " OIL DISCHARGES, OCEANS, STATISTICS, TANKERS, WASTEWATERS, NATURALSEEPAGE, *SCARLET PRAWN
0705 SPECTROMETRY, SOURCES, HYDROCARBONS , CHROMATOGRAPHY, CHEMICAL ANALYSIS
0729 " PETROLEUM PRODUCTS, DETECTION, CHEMICAL ANALYSIS, *FLUORESCENCE SPECTROPHOTOMETRY
0742 " SEDIMENTS, SEAWATER, PAH, NATURAL SEEPAGE, CHROMATOGRAPHY, CHEMICAL ANALYSIS, *HEADSPACE SAMPLING
0718 SPECTROSCOPY, HYDROCARBONS , CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIODEGRADATION, WEATHERING, *WATER SLUICES
0724 " PETROLEUM PRODUCTS, STATISTICS, STATISTICAL ANALYSIS
0753 " SOURCE IDENTIFICATION, SANTA BARBARA CHANNEL, NATURAL SEEPAGE, CHEMICAL ANALYSIS, WEATHERING, *IR
0761 SPILL CLEANUP, SKIMMERS, SHIPS, OIL-WATER SEPARATION, DESIGN-ENGINEERING, SPILL REMOVAL
0762 " SKIMMERS, SHIPS, PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING
0763 " NORTH SEA, EQUIPMENT, EKOFISK BLOWOUT, SPILL CONTAINMENT
0764 " SHIPS, POLLUTION CONTROL, PERFORMANCE TESTING, NEW YORK, DISPERSANTS, BIODEGRADATION, *COREXIT 9527
0765 " SKIMMERS, SHIPS, PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING, OIL REMOVAL, TANKERS
0766 " FRANCE, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL
0768 " SHIPS, POLLUTION CONTROL, OCEANS, FRANCE, DESIGN-ENGINEERING
0769 " SEA SURFACE, PATENT, DISPERSANTS, SURFACTANTS
0770 " SORBENTS, OIL TANKS, ICE, COLD CLIMATES, ALASKA , SPILL REMOVAL
0771 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL
0772 " SHIPS, PATENT, EQUIPMENT, BOOMS, DISIGN-ENGINEERING
0774 " SKIMMERS, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, *OHMSETT
0778 " SKIMMERS, PATENT, EQUIPMENT, DESIGN-ENGINEERING
0779 " ICE, BUZZARDS BAY, BOUCHARD 65 SPILL, SPILL REMOVAL, SPREADING, WEATHERING
0780 " PRODUCT INFORMATION, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, UK, *INVICTACAT
0782 " PERFORMANCE TESTING, OIL-WATER SEPARATION, EQUIPMENT, ARCTIC
0786 " DISPERSANTS, BIODEGRADATION, TOXICITY
0787 " PATENT, OIL SLICKS, SURFACTANTS, SINKING AGENT
0788 " PATENT, *GELLING AGENT
0789 " PATENT, LAND SPILLS, CONTAMINATION, WASTE OIL TREATMENT
0793 " SKIMMERS, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, BOOMS, *OHMSETT
0794 " SKIMMERS, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, BOOMS, *OHMSETT
0796 " SKIMMERS, PATENT, DESIGN-ENGINEERING
0799 " SKIMMERS, SHIPS, PATENT, OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING
0801 " SCOTLAND, OIL SPILLS, MORTALITY, ENVIRONMENTAL EFFECTS, BIRDS, ANIMALS, *ESSO BERNICIA SPILL
0802 " SKIMMERS, PATENT, EQUIPMENT, DESIGN-ENGINEERING
0803 " SORBENTS, PATENT, EMULSIONS, ADSORPTION
0804 " PERFORMANCE TESTING, DISPERSANTS, CONTINGENCY PLANNING, CHEMICAL EFFECTS, CALIFORNIA, BIOLOGICAL EFFECTS
0806 " POLLUTION CONTROL, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, *TOWED PLANING SLED
0808 " PERSONNEL TRAINING, CONTINGENCY PLANNING, SPILL RESPONSE, REGULATION, *VIDEO TAPES
0818 " REGULATIONS, LIABILITY, LEGISLATION, INSURANCE, EPA, SPILL REMOVAL, *SUPERFUND
0819 " POLLUTION PREVENTION, OFFSHORE, INTERNATIONAL AGREEMENTS, GREENLAND, DENMARK, CANADA
0826 " POLLUTION CONTROL, EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, SPILL RESPONSE, UK
0945 " POLLUTION PREVENTION, POLLUTION CONTROL, OIL SPILLS, EPA, ENVIRONMENTAL EFFECTS, *RESEARCH SUMMARY
0954 " PERFORMANCE TESTING, BIODEGRADATION, BACTERIA
1038 " OIL SPILLS, IRELAND, ENVIRONMENTAL EFFECTS, BAYS, TANKERS, SPREADING, *BETELGEUSE SPILL

1057 SPILL CLEANUP, SCOTLAND, OIL TERMINALS, CONTINGENCY PLANNING, SPILL RESPONSE, TANKERS, *ESSO BERNICIA SPILL, *SULLOM VOE TERMINAL
1067 " LIABILITY, LEGISLATION, COMPENSATION, COASTAL WATERS
0754 SPILL CONTAINMENT, EQUIPMENT, DESIGN-ENGINEERING, *PNEUMATIC BARRIER
0755 " EQUIPMENT, DESIGN-ENGINEERING, BOOMS, PERFORMANCE TESTIING, *PNEUMATIC BARRIER
0756 " PATENT, DESIGN-ENGINEERING, BOOMS
0757 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, BOOMS
0758 " PATENT, OIL-WATER SEPARATION, EQUIPMENT, DESIGN-ENGINEERING, BOOMS
0759 " PATENT, DESIGN-ENGINEERING, BOOMS
0760 " PATENT, DESIGN-ENGINEERING, BOOMS
0763 " SPILL CLEANUP, NORTH SEA, EQUIPMENT, EKOFISK BLOWOUT
1028 " POLLUTION CONTROL, BLOWOUTS, SPILL RESPONSE, MEXICO, *IXTOC 1 BLOWOUT
0809 SPILL COOPERATIVES, RIVERS, POLLUTION PREVENTION, POLLUTION CONTROL, OIL INDUSTRY, DELAWARE, SPILL RESPONSE
0810 " PERSONNEL TRAINING, OIL INDUSTRY, SPILL RESPONSE
0811 " OIL INDUSTRY, CONTINGENCY PLANNING, SPILL RESPONSE
0815 " OIL INDUSTRY, GOVERNMENT AGENCIES, CONTINGENCY PLANNING, CANADA
0761 SPILL REMOVAL, SPILL CLEANUP, SKIMMERS, SHIPS, OIL-WATER SEPARATION, DESIGN-ENGINEERING
0766 " SPILL CLEANUP, FRANCE, EQUIPMENT, DESIGN-ENGINEERING
0767 " SKIMMERS, EQUIPMENT, AMOCO CADIZ SPILL
0770 " SPILL CLEANUP, SORBENTS, OIL TANKS, ICE, COLD CLIMATES, ALASKA
0771 " SPILL CLEANUP, PATENT, EQUIPMENT, DESIGN-ENGINEERING
0773 " PATENT, DESIGN-ENGINEERING
0779 " SPILL CLEANUP, ICE, BUZZARDS BAY, BOUCHARD 65 SPILL, SPREADING, WEATHERING
0783 " PERFORMANCE TESTING, OIL SLICKS, EQUIPMENT, CRUDE OIL, BURNING, *INCENDIARY DEVICES
0784 " PATENT, EQUIPMENT, DESIGN-ENGINEERING
0785 " SKIMMERS, PATENT, EQUIPMENT, DESIGN-ENGINEERING
0791 " EQUIPMENT, DESIGN-ENGINEERING, AMOCO CADIZ SPILL, *OIL MOP
0792 " ENVIRONMENTAL EFFECTS, DISPERSANTS, BIODEGRADATION, WEATHERING
0798 " SORBENTS, POLLUTION CONTROL, ABSORPTION,*CEDAR WASTE
0800 " SKIMMERS, PATENT, EQUIPMENT, DESIGN-ENGINEERING
0805 " SKIMMERS, PATENT, EQUIPMENT, DESIGN-ENGINEERING
0818 " SPILL CLEANUP, REGULATIONS, LIABILITY, LEGISLATION, INSURANCE, EPA, *SUPERFUND
0808 SPILL RESPONSE, SPILL CLEANUP, PERSONNEL TRAINING, CONTINGENCY PLANNING, REGULATION, *VIDEO TAPES
0809 " SPILL COOPERATIVES, RIVERS, POLLUTION PREVENTION, POLLUTION CONTROL, OIL INDUSTRY, DELAWARE
0810 " SPILL COOPERATIVES, PERSONNEL TRAINING, OIL INDUSTRY
0811 " SPILL COOPERATIVES, OIL INDUSTRY, CONTINGENCY PLANNING
0814 " POLLUTION PREVENTION, FUEL OIL, DISPERSANTS, CONTINGENCY PLANNING, BEACH CLEANUP, TANKERS
0817 " OIL INDUSTRY, GUIDELINES, EPA, CONTINGENCY PLANNING, *INLAND SPILLS
0826 " SPILL CLEANUP, POLLUTION CONTROL, EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, UK
0860 " OIL SPILLS, ENVIRONMENTAL EFFECTS, CONTINGENCY PLANNING, BIOLOGICAL EFFECTS
0931 " POLLUTION PREVENTION, POLLUTION CONTROL, OIL TRANSPORT, LEGISLATION, EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, BEHAVIOR, *CONFERENCE
1028 " SPILL CONTAINMENT, POLLUTION CONTROL, BLOWOUTS, MEXICO, *IXTOC 1 BLOWOUT
1032 " REGULATIONS, OIL DISCHARGES, MORTALITY, MARINE ORGANISMS, INTERNATIONAL AGREEMENTS
1039 " POLLUTION CONTROL, FISHERIES, DISPERSANTS, BIOLOGICAL EFFECTS, WILDLIFE, UK, *CHRISTOS BITAS SPILL
1056 " SCOTLAND, OIL TERMINALS, OIL SPILLS, FUEL OIL, ENVIRONMENTAL EFFECTS, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1057 " SPILL CLEANUP, SCOTLAND, OIL TERMINALS, CONTINGENCY PLANNING, TANKERS, *ESSO BERNICIA SPILL, *SULLOM VOE TERMINAL
0977 SPILL TRAJECTORIES, PREDICTIONS, MOVEMENT, MODELS, GREENLAND, *DAVIS STRAIT
0979 " OIL SPILLS, OCS, MODELS, FLORIDA, PREDICTION
0980 " PREDICTIONS, OIL SLICKS, MOVEMENT, MODELS
0982 " RISK ANALYSIS, OCS, MODELS, USGS
0986 " SEA SURFACE, OIL SPILLS, MODELS, DRIFT, BEHAVIOR, PREDICITIONS
0987 " NEW YORK, MODELS, DRIFT, BEHAVIOR
R081 " RIVERS, MOVEMENT, MODELS, DISPERSION
0779 SPREADING, SPILL REMOVAL, SPILL CLEANUP, ICE, BUZZARDS BAY, BOUCHARD 65 SPILL, WEATHERING
0983 " SEA SURFACE, OIL SLICKS, DRIFT
1038 " SPILL CLEANUP, OIL SPILLS, IRELAND, ENVIRONMENTAL EFFECTS, BAYS, TANKERS, *BETELGEUSE SPILL
0939 ST. LAWRENCE RIVER, PAH, MARSHES, FRESHWATER, FISH, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, WILDLIFE, *NEPCO 140 SPILL
1108 STATE GOVERNMENTS, RECYCLING, RECLAMATION, LEGISLATION, HEALTH HAZARDS, EUROPE, ENVIRONMENTAL EFFECTS, CRANKCASE OIL, WASTE OIL, DISPOSAL, US
0724 STATISTICAL ANALYSIS, SPECTROSCOPY, PETROLEUM PRODUCTS, STATISTICS
0724 STATISTICS, STATISTICAL ANALYSIS, SPECTROSCOPY, PETROLEUM PRODUCTS
0984 " PREDICTIONS, OIL SPILLS, MODELS, INFORMATION SYSTEMS, CANADA
0991 " MARINE ENVIRONMENT, FATE, ENVIRONMENTAL EFFECTS, BEHAVIOR
0992 " SOURCES, OIL TRANSPORT, OIL INDUSTRY, NORTH SEA, DISTRIBUTION, TAR

1004 STATISTICS, REGULATIONS, OIL INDUSTRY, GUIDELINES, EUROPE, ENVIRONMENTAL EFFECTS
1035 " SEGREGATED BALLAST, SAFETY, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO, CRUDE OIL WASHING, TANKERS
1046 " SOURCES, REGULATIONS, OIL DISCHARGES, BALLAST , TANKERS, *ACCIDENTS
1070 " OIL SPILLS, IRELAND, UK
1080 " REFINERIES, EUROPE, WASTEWATER TREATMENT
1083 " REUSE, REFINING, WASTE OIL TREATMENT
1112 " SOURCES, OIL DISCHARGES, OCEANS, TANKERS, WASTEWATERS, NATURALSEEPAGE, *SCARLET PRAWN
0899 STORAGE, ENVIRONMENTAL EFFECTS, CRUDE OIL,EIS, STRATEGIC PETROLEUM RESERVE, TEXAS
0900 " ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, TEXAS
0901 " ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE
0902 " ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, LOUSISANA, TEXAS
0903 " LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, TEXAS
0904 " LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, TEXAS
0905 " LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, TEXAS
0906 " LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE
0907 " ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, TEXAS
0915 " ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, STRATEGIC PETROLEUM RESERVE, TEXAS
1073 " SOURCES, REGULATIONS, POLLUTION CONTROL, PIPELINES, PETROLEUM PRODUCTS, GROUNDWATER, CONTAMINATION
0899 STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, CRUDE OIL,EIS, TEXAS
0900 " STORAGE, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, TEXAS
0901 " STORAGE, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL
0902 " STORAGE, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, LOUSISANA, TEXAS
0903 " STORAGE, LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, TEXAS
0904 " STORAGE, LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, TEXAS
0905 " STORAGE, LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, TEXAS
0906 " STORAGE, LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL
0907 " STORAGE, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, TEXAS
0915 " STORAGE, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, TEXAS
0880 SUBARCTIC REGIONS, SOIL, FUNGI, CRUDE OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, BACTERIA, ALASKA , YEASTS, TOXICITY
0926 " SOIL, PHYSICAL EFFECTS, ENVIRONMENTAL EFFECTS, CRUDE OIL, CHEMICAL EFFECTS, ALASKA , *TUNDRA
0994 " SOIL, FUEL OIL, FATE, CRUDE OIL, ALASKA , BIODEGRATION
0849 SUBLETHAL EFFECTS, SAMPLING, MODELS, MARSHES, FUEL OIL, CRUDE OIL
0857 " REPRODUCTION, GROWTH, FUEL OIL, CRUSTACEANS, WSF
0862 " PLANTS, HYDROCARBONS , *PHOTOSYNTHESIS
0864 " HYDROCARBONS , FISH, CRUSTACEANS, BIOASSAY
0865 " CRUDE OIL, AROMATIC HYDROCARBONS, ALASKA , RESPIRATION, *HEART RATE, *NAPHTHALENE, *BENZENE, *PARALITHODES CAMTSCHATICA
0877 " RECOVERY, MARINE ORGANISMS, HYDROCARBONS , ALASKA , ACUTE EFFECTS, WSF, TOXICITY
0881 " REFINERIES, FISH, BIOINDICATORS, BIOASSAY, TOXICITY, WASTEWATERS
0882 " MORTALITY, GROWTH, BIRDS, TOXICITY, *ANAS PLATYRHYNCHOS
0885 " REPRODUCTION, MORTALITY, BIOLOGICAL EFFECTS, WSF, TOXICITY, *COPEPOD, *NITOCRA AFFINIS
0769 SURFACTANTS, SPILL CLEANUP, SEA SURFACE, PATENT, DISPERSANTS
0787 " SPILL CLEANUP, PATENT, OIL SLICKS, SINKING AGENT
0694 SURVEILLANCE, REMOTE SENSING, DETECTION, USCG, *RADAR SYSTEM
0699 " REMOTE SENSING, POLLUTION CONTROL, FRANCE, COASTAL WATERS
0702 " REMOTE SENSING, OIL SPILLS, DETECTION
0704 " REMOTE SENSING, POLLUTION CONTROL, COASTAL WATERS, USCG
1062 " SCOTLAND, OIL-WATER SEPARATION, OIL TERMINALS, OIL SPILLS, FUEL OIL, BIOLOGICAL EFFECTS, TANKERS, *SULLOM VOE TERMINAL
0695 SWEDEN, SHIPS, REMOTE SENSING, OIL SLICKS, MONITORING, DETECTION, TANKERS
0695 TANKERS, SWEDEN, SHIPS, REMOTE SENSING, OIL SLICKS, MONITORING, DETECTION
0765 " SPILL CLEANUP, SKIMMERS, SHIPS, PRODUCT INFORMATION, EQUIPMENT, DESIGN-ENGINEERING, OIL REMOVAL
0775 " PATENT, DESIGN-ENGINEERING, OIL REMOVAL, *PUMPING
0776 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, OIL REMOVAL
0777 " PATENT, OIL REMOVAL, DESIGN-ENGINEERNG, *PUMPING
0814 " SPILL RESPONSE, POLLUTION PREVENTION, FUEL OIL, DISPERSANTS, CONTINGENCY PLANNING, BEACH CLEANUP
0821 " SAFETY, REGULATIONS, INTERNATIONAL CONVENTIONS, USCG
0822 " REGULATIONS, OIL-WATER SEPARATION, OIL DISCHARGES, IMCO, EQUIPMENT, USCG
0823 " REGULATIONS, POLLUTION PREVENTION, OIL TRANSPORT, USCG
0933 " SCOTLAND, OIL TERMINALS, OIL DISCHARGES, ENVIRONMENTAL EFFECTS, BEACHES, BALLAST , *SHETLAND ISLANDS
0936 " RECOVERY, OIL SPILLS, ENVIRONMENTAL EFFECTS, CHRONIC EFFECTS, AFRICA, *VENPET-VENOIL SPILL

0941 TANKERS, SHIPS, OIL DISCHARGES, JAPAN, CONTAMINATION, COASTAL ZONE MANAGEMENT, COASTAL WATERS
0972 " OIL SLICKS, OIL INDUSTRY, MOVEMENT, DELAWARE BAY, CRUDE OIL
1001 " OFFSHORE, LOUISIANA, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, DEEPWATER PORTS
1027 " REFINING, PRODUCTION, OIL TRANSPORT, OFFSHORE, OCS, INTERNATIONAL AGREEMENTS, DEVELOPMENT, *CHINA SEA, *MARINE REGIONALISM
1031 " SAFETY, REGULATIONS, OIL TRANSPORT, LIABILITY, LAW ENFORCEMENT, INTERNATIONAL AGREEMENTS, IMCO
1033 " OIL SPILLS, ICE, FUEL OIL, COLD CLIMATES, CANADA, *KURDISTAN SPILL, *NOVA SCOTIA
1034 " SHIPS, SEGREGATED BALLAST, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO
1035 " STATISTICS, SEGREGATED BALLAST, SAFETY, POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS, IMCO, CRUDE OIL WASHING
1036 " SAFETY, *INERT GAS SYSTEMS
1037 " SAFETY, POLLUTION PREVENTION, PERSONNEL TRAINING, OIL SPILLS, BALLAST
1038 " SPREADING, SPILL CLEANUP, OIL SPILLS, IRELAND, ENVIRONMENTAL EFFECTS, BAYS, *BETELGEUSE SPILL
1040 " SAFETY, POLLUTION PREVENTION, DEEPWATER PORTS, ALASKA , *VALDEZ NARROWS
1041 " SAFETY, REGULATIONS, OIL TRANSPORT, MONITORING, INTERNATIONAL AGREEMENTS, ENGLISH CHANNEL
1042 " SAFETY, REGULATIONS, POLLUTION PREVENTION, PERSONNEL TRAINING, API
1043 " SHIPS, PORTS , OCS, DEVELOPMENT
1044 " SHIPS, SAFETY, REGULATIONS, GUIDELINES, USCG
1045 " SEGREGATED BALLAST, REGULATIONS, OIL TRANSPORT, EQUIPMENT, DESIGN-ENGINEERING
1046 " STATISTICS, SOURCES, REGULATIONS, OIL DISCHARGES, BALLAST , *ACCIDENTS
1047 " RISK ANALYSIS, OIL TRANSPORT, ECONOMICS, DESIGN-ENGINEERING, ARCTIC, *SUBMARINE TANKERS
1048 " POLLUTION PREVENTION, PERFORMANCE TESTING, DESIGN-ENGINEERING, *SINKING TESTS
1049 " SAFETY, POLLUTION CONTROL, OIL TRANSPORT
1050 " SHIPS, OIL SLICKS, OIL DISCHARGES, MONITORING, EQUIPMENT, BALLAST
1051 " POLLUTION PREVENTION, IMCO, CRUDE OIL WASHING
1057 " SPILL RESPONSE, SPILL CLEANUP, SCOTLAND, OIL TERMINALS, CONTINGENCY PLANNING, *ESSO BERNICIA SPILL, *SULLOM VOE TERMINAL
1058 " POLLUTION CONTROL, PETROLEUM PRODUCTS, OIL TRANSFER, OIL TERMINALS, LEAKAGE, HYDROCARBONS , CRUDE OIL
1059 " POLLUTION PREVENTION, OIL TRANSFER, EQUIPMENT
1060 " OIL TERMINALS, OIL SPILLS, MORTALITY, FUEL OIL, ENVIRONMENTAL EFFECTS, COASTS, BIRDS, WILDLIFE, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1061 " OIL TERMINALS, OIL SPILLS, ENVIRONMENTAL EFFECTS, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
1062 " SURVEILLANCE, SCOTLAND, OIL-WATER SEPARATION, OIL TERMINALS, OIL SPILLS, FUEL OIL, BIOLOGICAL EFFECTS, *SULLOM VOE TERMINAL
1063 " SEGREGATED BALLAST, REGULATIONS, PORTS , POLLUTION CONTROL, OIL DISCHARGES, US, USCG, WASTEWATERS
1064 " SHIPS, REGULATIONS, OIL TRANSPORT, LIABILITY, LEGISLATION, INTERNATIONAL CONVENTIONS, INTERNATIONAL AGREEMENTS, *LAW OF THE SEA
1065 " SAFETY, REGULATIONS, PERSONNEL TRAINING, OIL SPILLS
1068 " SAFETY, POLLUTION CONTROL, LIABILITY, IMCO, INTERNATIONAL CONVENTION, *LAW OF THE SEA
1071 " POLLUTION PREVENTION, OIL TRANSPORT, ENVIRONMENTAL EFFECTS, ALASKA , TRANS-ALASKA PIPELINE
1072 " SAFETY, REGULATIONS, POLLUTION PREVENTION, OIL TRANSPORT, OIL TRANSFER, DELAWARE BAY
1074 " MEDITERRANEAN SEA, BALLAST , WASTEWATER TREATMENT, OIL REMOVAL
1101 " SHIPS, OIL-WATER SEPARATION, BALLAST
1112 " STATISTICS, SOURCES, OIL DISCHARGES, OCEANS, WASTEWATERS, NATURALSEEPAGE, *SCARLET PRAWN
0719 TAR, SOURCE IDENTIFICATION, HYDROCARBONS , CHROMATOGRAPHY, CHEMICAL ANALYSIS
0961 " PETROLEUM PRODUCTS, HYDROCARBONS , GROWTH, FUNGI, CONCENTRATIONS, BIODEGRADATION, *FUSARIUM
0967 " SEDIMENTS, FATE, ARGO MERCHANT SPILL, ANALYTICAL TECHNIQUES, CHROMATOGRAHY
0975 " OIL SPILLS, FATE, BIODEGRADATION, BERMUDA, WEATHERING, TROPICAL REGIONS
0976 " PHYSICAL ASPECTS, MEDITERRANEAN SEA, FATE, AROMATIC HYDROCARBONS, WASTE OIL
0992 " STATISTICS, SOURCES, OIL TRANSPORT, OIL INDUSTRY, NORTH SEA, DISTRIBUTION
R079 " SEDIMENTS, MODELS, HYDROCARBONS , FATE, DISTRIBUTION, BERMUDA
0838 TAR SANDS, SLUDGE , RIVERS, OIL SPILLS, MORTALITY, INVERTEBRATES, FRESHWATER, CANADA, BENTHOS, TOXICITY
0899 TEXAS, STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, CRUDE OIL,EIS
0900 " STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL
0902 " STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL, LOUSISANA
0903 " STRATEGIC PETROLEUM RESERVE, STORAGE, LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL
0904 " STRATEGIC PETROLEUM RESERVE, STORAGE, LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL

0905 TEXAS, STRATEGIC PETROLEUM RESERVE, STORAGE, LOUISIANA, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL
0907 " STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL
0915 " STRATEGIC PETROLEUM RESERVE, STORAGE, ENVIRONMENTAL EFFECTS, EIS, CRUDE OIL
1020 " OIL-GAS LEASING, OIL FIELDS, OFFSHORE, MODELS, ENVIRONMENTAL EFFECTS
0686 TOXICITY, MONITORING, DETECTION, CONTAMINATION, BIOLOGICAL EFFECTS, BIOINDICATORS
0690 " MONITORING, FISH, CONTAMINATION, ANALYTICAL TECHNIQUES, UPTAKE, *BIOPSY
0714 " PHYSICAL ASPECTS, PETROLEUM PRODUCTS, EVAPORATION, CHEMICAL ANALYSIS
0722 " PAH, CHROMATOGRAPHY, BIOASSAY, ANALYTICAL TECHNIQUES
0786 " SPILL CLEANUP, DISPERSANTS, BIODEGRADATION
0838 " TAR SANDS, SLUDGE , RIVERS, OIL SPILLS, MORTALITY, INVERTEBRATES, FRESHWATER, CANADA, BENTHOS
0843 " MARINE ORGANISMS, BIOLOGICAL EFFECTS, BEHAVIOR
0844 " METABOLISM, HYDROCARBONS , FISH, BERING SEA, UPTAKE, *NAPHTHALENE
0845 " MORTALITY, HYDROCARBONS , CHRONIC EFFECTS, BIRDS, ANALYTICAL TECHNIQUES, ACUTE EFFECTS, WILDLIFE
0846 " MORTALITY, CRUSTACEANS, BIOLOGICAL EFFECTS, WSF
0852 " SEDIMENTS, MICROORGANISMS, LAKES , CRUDE OIL, BIOLOGICAL EFFECTS, BACTERIA, ARCTIC
0853 " MORTALITY, HYDROCARBONS , FISH, CRUSTACEANS, CRUDE OIL, ACUTE EFFECTS, WSF, *TEMPERATURE EFFECTS
0854 " MORTALITY, FISH, CRUDE OIL, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, *ONCORHYNCHUS GORBUSCHA, *EUALUS SPP., *PANDALUS GONIURUS
0855 " PAH, OIL INDUSTRY, OIL DISCHARGES, ECOSYSTEMS
0869 " CRUDE OIL, BIOLOGICAL EFFECTS, ALASKA , *AQUATIC INSECTS, *TUNDRA
0872 " CRUDE OIL, BIOLOGICAL EFFECTS, BIOASSAY, ARCTIC, ALASKA , ZOOPLANKTON
0874 " SOURCES, PETROLEUM PRODUCTS, FISH, DELAWARE BAY, CRUDE OIL, BIOLOGICAL EFFECTS, SHELLFISH, *URBAN RUNOFF
0875 " PETROLEUM PRODUCTS, MORTALITY, CRUDE OIL, BIRDS, ALASKA , *HATCHING, *LARUS GLAUCESCENS
0877 " SUBLETHAL EFFECTS, RECOVERY, MARINE ORGANISMS, HYDROCARBONS , ALASKA , ACUTE EFFECTS, WSF
0878 " FISH, CRUDE OIL, CONTAMINATION, AROMATIC HYDROCARBONS, WSF, *BIOACCUMULATION
0880 " SUBARCTIC REGIONS, SOIL, FUNGI, CRUDE OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, BACTERIA, ALASKA , YEASTS
0881 " SUBLETHAL EFFECTS, REFINERIES, FISH, BIOINDICATORS, BIOASSAY, WASTEWATERS
0882 " SUBLETHAL EFFECTS, MORTALITY, GROWTH, BIRDS, *ANAS PLATYRHYNCHOS
0884 " MORTALITY, GROWTH, DISPERSANTS, CRUSTACEANS, *IDOTEA BALTICA
0885 " SUBLETHAL EFFECTS, REPRODUCTION, MORTALITY, BIOLOGICAL EFFECTS, WSF, *COPEPOD, *NITOCRA AFFINIS
0887 " MORTALITY, MOLLUSKS, MARINE ORGANISMS, DISPERSANTS, CONCENTRATIONS
0888 " RECOVERY, PLANTS, CRUDE OIL, CONTINGENCY PLANNING, BIOLOGICAL EFFECTS, ALASKA , *DIESEL OIL
0889 " REPRODUCTION, MORTALITY, FUEL OIL, BIRDS, BIOLOGICAL EFFECTS
0895 " SOIL, RECOVERY, CRUDE OIL, CHRONIC EFFECTS, ALASKA , VEGETATION, *TUNDRA
0924 " SEDIMENTS, RECOVERY, MASSACHUSETTS, MARSHES, FUEL OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, *FUNDULUS
0925 " ENVIRONMENTAL EFFECTS, CRUDE OIL, BIODEGRADATION, ALASKA , *PROCEEDINGS
0969 " SOIL, PLANTS, LAND SPILLS, BIODEGRADATION
0990 " SEDIMENTS, PETROLEUM PRODUCTS, MICROORGANISMS, ENVIRONMENTAL EFFECTS, BIODEGRADATION
R074 " FUEL OIL, FRESHWATER, DEPURATION, CHEMICAL ANALYSIS, BIOASSAY, WSF, UPTAKE
R075 " MUTAGENS, FUEL OIL, BIOASSAY, BACTERIA, ANIMALS, YEASTS
R076 " MOLLUSKS, HYDROCARBONS , FISH, CRUSTACEANS, BIOLOGICAL EFFECTS
0897 TRANS-ALASKA PIPELINE, OIL TRANSPORT, HYDROCARBONS , GULF OF ALASKA, BASELINE STUDIES, ANALYTICAL TECHNIQUES
1015 " RESOURCE MANAGEMENT, OIL SPILLS
1017 " MONITORING, ENVIRONMENTAL EFFECTS, *CONSTRUCTION
1052 " SOCIOECONOMIC EFFECTS, PIPELINES, ALASKA
1071 " TANKERS, POLLUTION PREVENTION, OIL TRANSPORT, ENVIRONMENTAL EFFECTS, ALASKA
0841 TROPICAL REGIONS, INTERTIDAL ZONE, BIOLOGICAL EFFECTS
0975 " TAR, OIL SPILLS, FATE, BIODEGRADATION, BERMUDA, WEATHERING
0780 UK, SPILL CLEANUP, PRODUCT INFORMATION, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, *INVICTACAT
0826 " SPILL RESPONSE, SPILL CLEANUP, POLLUTION CONTROL, EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING
0835 " OIL TRANSFER, OIL SPILLS, MORTALITY, BIRDS, BIOLOGICAL EFFECTS, *WALES, *PODICEPS CRISTATUS
0920 " OFFSHORE, NORWAY, NORTH SEA, LIABILITY, LEGISLATION, INTERNATIONAL CONVENTIONS, DEVELOPMENT, CONPENSATION
1006 " RESOURCE MANAGEMENT, OIL INDUSTRY, OFFSHORE, NORTH SEA, FISHERIES, DEVELOPMENT
1039 " SPILL RESPONSE, POLLUTION CONTROL, FISHERIES, DISPERSANTS, BIOLOGICAL EFFECTS, WILDLIFE, *CHRISTOS BITAS SPILL
1054 " PIPELINES, NORTH SEA, MONITORING, LEAKAGE, EQUIPMENT, DETECTION
1070 " STATISTICS, OIL SPILLS, IRELAND
0690 UPTAKE, TOXICITY, MONITORING, FISH, CONTAMINATION, ANALYTICAL TECHNIQUES, *BIOPSY

0836 UPTAKE, SEDIMENTS, OCS, MARINE ORGANISMS, HYDROCARBONS , BENTHOS, ALASKA ,
*DEPOSIT-FEEDERS
0844 " TOXICITY, METABOLISM, HYDROCARBONS , FISH, BERING SEA, *NAPHTHALENE
0856 " METABOLISM, FISH, AROMATIC HYDROCARBONS, *SALMO SALAR L.
0858 " MOLLUSKS, MARINE ORGANISMS, HYDROCARBONS , DEPURATION, BIOLOGICAL EFFECTS,
*BIVALVES
0859 " MOLLUSKS, METABOLISM, MARINE ORGANISMS, HYDROCARBONS , BIOLOGICAL EFFECTS,
BIOINDICATORS, *DETOXIFICATION MECHANISMS
0871 " MOLLUSKS, HYDROCARBONS , DEPURATION, BIOLOGICAL EFFECTS, *TAPES SEMIDECUSSATA
0873 " FISH, DEPURATION, CRUDE OIL, AROMATIC HYDROCARBONS, *ANGUILLA JAPONICA, *SULFUR
0886 " METABOLISM, FISH, DEPURATION, AROMATIC HYLRCARBONS, *NAPHTHALENE
R074 " TOXICITY, FUEL OIL, FRESHWATER, DEPURATION, CHEMICAL ANALYSIS, BIOASSAY, WSF
1063 US, TANKERS, SEGREGATED BALLAST, REGULATIONS, PORTS , POLLUTION CONTROL, OIL
DISCHARGES, USCG, WASTEWATERS
1107 " RECLAMATION, LUBRICATING OIL, HYDROCARBONS , CRANKCASE OIL, CHROMATOGRAPHY,
CHEMICAL ANALYSIS, WASTE OIL
1108 " STATE GOVERNMENTS, RECYCLING, RECLAMATION, LEGISLATION, HEALTH HAZARDS, EUROPE,
ENVIRONMENTAL EFFECTS, CRANKCASE OIL, WASTE OIL, DISPOSAL
0694 USCG, SURVEILLANCE, REMOTE SENSING, DETECTION, *RADAR SYSTEM
0704 " SURVEILLANCE, REMOTE SENSING, POLLUTION CONTROL, COASTAL WATERS
0749 " SOURCE IDENTIFICATION, ANALYTICAL TECHNIQUES, WEATHERING
0821 " TANKERS, SAFETY, REGULATIONS, INTERNATIONAL CONVENTIONS
0822 " TANKERS, REGULATIONS, OIL-WATFR SEPARATION, OIL DISCHARGES, IMCO, EQUIPMENT
0823 " TANKERS, REGULATIONS, POLLUTION PREVENTION, OIL TRANSPORT
1025 " SAFETY, OIL-GAS LEASING, OCS, ENVIRONMENTAL EFFECTS, DEVELOPMENT
1044 " TANKERS, SHIPS, SAFETY, REGULATIONS, GUIDELINES
1063 " US, TANKERS, SEGREGATED BALLAST, REGULATIONS, PORTS , POLLUTION CONTROL, OIL
DISCHARGES, WASTEWATERS
0982 USGS, SPILL TRAJECTORIES, RISK ANALYSIS, OCS, MODELS
R072 USN, SEAWATER, ANALYTICAL TECHNIQUES
0733 USSR, SEAWATER, PHYTOPLANKTON, HYDROCARBONS , CONTAMINATION, CHROMATOGRAPHY, CHEMICAL
ANALYSIS
0957 " MICROORGANISMS, BIODEGRADATION, BACTERIA, ARCTIC, *MYOBACTERIUM SP.
1077 " REFINERIES, PETROCHEMICALS, EQUIPMENT, WASTE OIL TREATMENT, SLUDGES
0895 VEGETATION, TOXICITY, SOIL, RECOVERY, CRUDE OIL, CHRONIC EFFECTS, ALASKA , *TUNDRA
1019 WASHINGTON, OREGON, ONSHORE IMPACTS, OIL-GAS LEASING, OFFSHORE, OCS, GULF OF ALASKA,
ENVIRONMENTAL EFFECTS, DEVELOPMENT
0976 WASTE OIL, TAR, PHYSICAL ASPECTS, MEDITERRANEAN SEA, FATE, AROMATIC HYDROCARBONS
1107 " US, RECLAMATION, LUBRICATING OIL, HYDROCARBONS , CRANKCASE OIL, CHROMATOGRAPHY,
CHEMICAL ANALYSIS
1108 " US, STATE GOVERNMENTS, RECYCLING, RECLAMATION, LEGISLATION, HEALTH HAZARDS,
EUROPE, ENVIRONMENTAL EFFECTS, CRANKCASE OIL, DISPOSAL
1110 " REFINING, RECYCLING, RECLAMATION, LUBRICATING OIL, ENVIRONMENTAL EFFECTS
0789 WASTE OIL TREATMENT, SPILL CLEANUP, PATENT, LAND SPILLS, CONTAMINATION
1077 " USSR, REFINERIES, PETROCHEMICALS, EQUIPMENT, SLUDGES
1078 " RECLAMATION, PATENT, LUBRICATING OIL
1083 " STATISTICS, REUSE, REFINING
1106 " RECYCLING, RECLAMATION
0689 WASTEWATERS, PETROLEUM PRODUCTS, DETECTION, CHROMATOGRAPHY, *HEAD-SPACE METHOD
0735 " REFINING, MONITORING, CONTAMINATION, ANALYTICAL TECHNIQUES, *ENZYME INHIBITION
SCREENING
0881 " TOXICITY, SUBLETHAL EFFECTS, REFINERIES, FISH, BIOINDICATORS, BIOASSAY
0921 " OIL SPILLS, FATE, CHEMICAL EFFECTS, BIOLOGICAL EFFECTS, BALTIC SEA
0922 " REFINERIES, POLLUTION CONTROL, MONITORING, HEALTH HAZARDS, FATE, DEVELOPMENT,
BEHAVIOR, ANALYTICAL TECHNIQUES,ENVIRONMENTAL EFFECTS, *PROCEEDINGS
0942 " NEW YORK, FATE, ENVIRONMENTAL EFFECTS, CONTAMINATION, *NEW YORK BIGHT
0964 " REFINERIES, RECOVERY, HYDROCARBONS , FRANCE, CHRONIC EFFECTS, BIODEGRADATION,
BEACHES
0999 " SOURCES, REFINERIES, HYDROCARBONS , FATE, DISTRIBUTION, *PERSISTENCE
1011 " RESOURCE MANAGEMENT, OIL SHALE, MODELS, ENVIRONMENTAL EFFECTS, REGULATION, COLORADO
1012 " RESOURCE MANAGEMENT, REGULATIONS, OIL SHALE, GROUNDWATER, ENVIRONMENTAL EFFECTS,
BIBLIOGRAPHIES, COLORADO
1023 " OCS, HYDROCARBONS , ENVIRONMENTAL EFFECTS, DRILLING, *BATEA, *NSPS
1029 " REFINING, MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS
1063 " USCG, US, TANKERS, SEGREGATED BALLAST, REGULATIONS, PORTS , POLLUTION CONTROL, OIL
DISCHARGES
1084 " PATENT, OIL-WATER SEPARATION, EMULSIONS, WASTEWATER TREATMENT
1086 " REFINERIES, POLLUTION PREVENTION, PETROLEUM PRODUCTS, OIL-WATER SEPARATION,
GUIDELINES, COST ANALYSIS
1091 " SOLID WASTES, OIL SHALE, BIBLIOGRAPHIES, DISPOSAL
1112 " TANKERS, STATISTICS, SOURCES, OIL DISCHARGES, OCEANS, NATURALSEEPAGE, *SCARLET
PRAWN
1074 WASTEWATER TREATMENT, TANKERS, MEDITERRANEAN SEA, BALLAST , OIL REMOVAL
1075 " REFINING, EXTRACTION
1079 " INDUSTRIES, OIL REMOVAL, *POLYETHYLENIMINE

1080 WASTEWATER TREATMENT, STATISTICS, REFINERIES, EUROPE
1081 " REFINERIES, POLLUTION CONTROL, FLOTATION, FLOCCULATION, BIBLIOGRAPHIES, *COAGULATION
1082 " SORBENTS, POLLUTION CONTROL, HYDROCARBONS , *HYDROPHOBIC MATERIAL
1084 " WASTEWATERS, PATENT, OIL-WATER SEPARATION, EMULSIONS
1085 " OIL REMOVAL *POLYELECTROLYTES
1087 " SORBENTS, PATENT, OIL SLICKS, ADSORPTION
1089 " PATENT, OXIDATION, OIL-WATER SEPARATION, FILTRATION, EMULSIONS
1090 " PATENT, FILTRATION, EMULSIONS, COMBUSTION
1093 " PATENT, HYDROCARBONS
1094 " PATENT, EMULSIONS
1095 " PATENT, OIL-WATER SEPARATION, ADSORPTION, *FERRITE POWDER
1096 " PATENT, OIL-WATER SEPARATION, ADSORPTION, *FERRITE POWDER
1097 " PATENT, OIL-WATER SEPARATION, FILTRATION
1098 " PATENT, FILTRATION
1099 " RIVERS, HEALTH HAZARDS, FLORIDA, EPA
R084 " POLLUTION PREVENTION, FUEL OIL, EQUIPMENT
R085 " RECYCLING, PERFORMANCE TESTING, EQUIPMENT, *MICRO-GAS-DISPERSION STRIPPING
0892 WATER QUALITY, SEDIMENTS, PETROLEUM PRODUCTS, CONCENTRATIONS, *DREDGING
0718 WEATHERING, SPECTROSCOPY, HYDROCARBONS , CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIODEGRADATION, *WATER SLUICES
0745 " SOURCE IDENTIFICATION, LAW ENFORCEMENT, EPA, CHEMICAL ANALYSIS
0749 " USCG, SOURCE IDENTIFICATION, ANALYTICAL TECHNIQUES
0753 " SPECTROSCOPY, SOURCE IDENTIFICATION, SANTA BARBARA CHANNEL, NATURAL SEEPAGE, CHEMICAL ANALYSIS, *IR
0779 " SPREADING, SPILL REMOVAL, SPILL CLEANUP, ICE, BUZZARDS BAY, BOUCHARD 65 SPILL
0792 " SPILL REMOVAL, ENVIRONMENTAL EFFECTS, DISPERSANTS, BIODEGRADATION
0975 " TROPICAL REGIONS, TAR, OIL SPILLS, FATE, BIODEGRADATION, BERMUDA
R070 " SOURCE IDENTIFICATION, REMOTE SENSING, PHYSICAL ASPECTS, OIL SPILLS, CRUDE OIL
0845 WILDLIFE, TOXICITY, MORTALITY, HYDROCARBONS , CHRONIC EFFECTS, BIRDS, ANALYTICAL TECHNIQUES, ACUTE EFFECTS
0898 " OIL TRANSPORT, OIL-GAS LEASING, OFFSHORE, OCS, HABITATS, FISH, ENVIRONMENTAL EFFECTS, DEVELOPMENT
0939 " ST. LAWRENCE RIVER, PAH, MARSHES, FRESHWATER, FISH, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, *NEPCO 140 SPILL
1010 " RISK ANALYSIS, LIABILITY, ENVIRONMENTAL EFFECTS, DRILLING, DEVELOPMENT, CANADA, ARCTIC, *LANCASTER SOUND
1039 " UK, SPILL RESPONSE, POLLUTION CONTROL, FISHERIES, DISPERSANTS, BIOLOGICAL EFFECTS, *CHRISTOS BITAS SPILL
1060 " TANKERS, OIL TERMINALS, OIL SPILLS, MORTALITY, FUEL OIL, ENVIRONMENTAL EFFECTS, COASTS, BIRDS, *SULLOM VOE TERMINAL, *ESSO BERNICIA SPILL
0846 WSF, TOXICITY, MORTALITY, CRUSTACEANS, BIOLOGICAL EFFECTS
0853 " TOXICITY, MORTALITY, HYDROCARBONS , FISH, CRUSTACEANS, CRUDE OIL, ACUTE EFFECTS, *TEMPERATURE EFFECTS
0857 " SUBLETHAL EFFECTS, REPRODUCTION, GROWTH, FUEL OIL, CRUSTACEANS
0870 " MARINE ENVIRONMENT, CRUDE OIL, BIOLOGICAL EFFECTS, ALGAE, *DUNALLIELA TERTIOLECTA
0877 " TOXICITY, SUBLETHAL EFFECTS, RECOVERY, MARINE ORGANISMS, HYDROCARBONS , ALASKA , ACUTE EFFECTS
0878 " TOXICITY, FISH, CRUDE OIL, CONTAMINATION, AROMATIC HYDROCARBONS, *BIOACCUMULATION
0885 " TOXICITY, SUBLETHAL EFFECTS, REPRODUCTION, MORTALITY, BIOLOGICAL EFFECTS, *COPEPOD, *NITOCRA AFFINIS
0988 " EVAPORATION, CRUDE OIL, COLD CLIMATES, CHROMATOGRAPHY, BIODEGRADATION, AROMATIC HYDROCARBONS, WSF, CRUDE OIL
R074 " UPTAKE, TOXICITY, FUEL OIL, FRESHWATER, DEPURATION, CHEMICAL ANALYSIS, BIOASSAY
0880 YEASTS, TOXICITY, SUBARCTIC REGIONS, SOIL, FUNGI, CRUDE OIL, CHRONIC EFFECTS, BIOLOGICAL EFFECTS, BIODEGRADATION, BACTERIA, ALASKA
R075 " TOXICITY, MUTAGENS, FUEL OIL, BIOASSAY, BACTERIA, ANIMALS
0840 ZOOPLANKTON, MICROORGANISMS, FRESHWATER, CONTAMINATION, BIOLOGICAL EFFECTS
0872 " TOXICITY, CRUDE OIL, BIOLOGICAL EFFECTS, BIOASSAY, ARCTIC, ALASKA

AUTHOR INDEX

Abaeva, T.V. 0769
Affens, W.A. 1036
Ahlert, R.C. 1102
Ailes, S.B. 0702
Albers, P.H. 0842
Alberts, D.A. 0808
Aldridge, A.K. 0705
Alexander, G. 0722
Alexander, M.M. 0939
Alexander, V. 0866
Allen, A.A. 0770
Amanjean, P. 0771
American Chemical Society 0696
Anderson, A.W. 0820
Anderson, J.W. 0836
Anderson, K.J. 0876
Antibus, R.K. 0837
Antibus, R.K. 0861
Antoine, S. 0812
Antonova, N.M. 0769
Antonova, N.M. 0884
Armant, D.R. 0735
Atlas, R.M. 0851
Atlas, R.M. 0879
Atlas, R.M. 0948
Atlas, R.M. 0959
Atlas, R.M. 0994
Aurelle, Y. 1076
Automation Industries 0922
Bachman, W.A. 1111
Badaway, M.I. 0781
Baker, R. 1007
Banta, J.S. 1003
Baring-Gould, M. 1052
Barker, J.L. 1113
Barringer, A.R. 0697
Barsdate, R.J. 0866
Barton, D.R. 0838
Bartos, J.J. 0772
Basile, B. 0725
Basile, B. 0726
Basile, B. 0727
Basile, B. 0728
Basile, R.J. 1000
Baumard, U. 0773
Bean, R.M. 1091
Bean, R.M. 1092
Beck, R. R077
Bedinger, C.A. 1008
Beernaert, H. 0706
Bender, E. 1009
Benfield, E. 0840
Bentz, A.P. 0745
Benville, P.E. 0870
Benville, P.E. 0871
Berge, G. 0923
Bergstein, P.E. 0949
Bernhardt, J.P. 1064
Berry, R. 1106
Berthold, R. 0681
Bhosle, N.B. 0887
Bibikov, G.G. 1077
Black, J.J. 0707
Blackwood, T.R. 0748
Blumer, M. 0708
Bodammer, J. R076
Boedefeld, E. 0855
Boeler, J.C. 0709
Bonevski, R. 0710
Borenstein, I. 1078
Bourke, R.C. 0713
Bourne, W.R.P. 1010
Bourne, W.R.P. 1057
Boyd, R.N. 0740
Brammer, J.D. R074
Brassell, S.C. 0746
Breslau, L.R. 0704
Breslin, M.K. 0774
Britton, G. 0950
Brooks, J.M. 0839
Brooks, P.W. 0705
Brown, A. 1011
Brown, A. 1012
Brown, J. 0888
Brown, R. 1071
Brown, R.L. 0740
Brubaker, M. R076
Bruce-Lockhast, M.P. 0683
Brunskill, G.J. 0925
Brusick, D.J. R075
Buikema, A. 0840
Buikema, A.L. 0735
Buja-Bijunas, L. 0701
Burghardt, E. 0720
Burklin, C.E. 1058
Burns, W.A. 0924
Busch, F. 0856
Butler, J. R079
Butler, J.N. 0976
Butler, M.G. 0869
Butseva, L.N. 1079
Cadron, E.C. 1080
Cahill, E.J. 0893
Cairns, J. 0735
Cairns, J. 0840
Callis, J.B. 0739
Cameron, J. 1037
Campbell, G.S. 0983
Cansfield, P.E. 0951
Capehart, B.L. 0979
Capizzi, R. 0722
Carlucci, G.D., Jr. 1021
Cartier, A. 1001
Cavagnaro, D.M. 1081
Cavanaugh, K.P. 0850
Cessou, M. 0775
Cessou, M. 0776
Cessou, M. 0777
Cevasco, F.M. 1059
Chan, E.I. 0841
Chang, E.S. 0725
Chang, E.S. 0726
Chang, E.S. 0727
Chapman, P. 0936
Cheatham, D.L. 0988
Chesler, S.N. 0711
Chesler, S.N. 0742
Chet, I. 0950
Chien, Y.T. 0747
Chmielewski, M.A. 0867
Christian, G.D. 0739
Chuckran, D.A. 0950
Clark, J. 0898
Cline, J. 0712
Cohen, A.L. 0784
Collier, T.K. 0863
Collins, C.M. 0930
Colwell, R.R. R078
Colwell, R.R. 0952
Comfort, G. 0755

Comm of the European Comm 0989
Conrad, J.M. 0813
Cook, P.P. 0713
Coon, N.C. 0842
Coon, N.C. 0889
Corwin, R. 1013
Costa, M. 0954
Costerton, J.W. 0925
Cotton, F.O. 1107
Crawford, D. 0829
Crecelius, E.A. 0836
Cripe, C.R. 0843
Cronshaw, J. 0850
Cross, J.N. 0913
Cross, T.F. 1038
Cundell, A.M. 0682
Curl, H., Jr. 0714
CONCAWE 0828
CONCAWE 1004
Davenport, C.Y. 0880
Davidson, E.R. 0739
Davies, D.H. 0778
Davies, J.H. 0697
Davies, J.S. 0953
Degen, L. 0962
Demeter, J. 1065
Den Tonkelaar, W.A.M. 0720
Dept of Trade, UK 0814
Dept of Trade, UK 1039
Deslauriers, P.C. 0779
Deveze, D. 0964
Devries, A.L. 0844
Dexlin, W.M. 1040
Dick, R. 0697
Dickson, K. 0840
Didyk, M.B. 0954
Dieter, M.P. 0845
Dieter, M.P. 0882
Dieterle, D. 0987
Dixon, T.R. 0780
Dixon, T.R. 1041
DiSalvo, L.H. 0990
Donahue, W.H. 0846
Dorset, P. 1014
Dorsey, T. 0708
Dredge, M.C.L. 0690
Duvall, P.M. 0713
Dymerski, P.P. 0707
Earley, D.E. 0748
Eastwood, D. 0749
Edamatsu, M. 108
Edwards, W.C. 074
Eglinton, G. 070
El-Dib, M.A. 0781
Ellington, G. 0746
Elliott, K.D. 1053
Elliott, P.F. 1053
Ellis, D.V. 0847
Environ Agency, Japan 0830
Environ Prot Serv Canada 0782
Environ Prot Serv Canada 0783
Environment Canada 0894
Epler, J.C. 0715
Espinosa, H. 1082
Ettelt, G.A. 0784
Everett, K. 0879
Everett, K. 0994
Everett, K.R. 0888
Everett, K.R. 0926
Farlow, J. R070
Farrington, J.W. 0891
Favorite, F. 0981
Feldmann, J.H. 1019
Fern, G.R.H. 0815
Ferrand, R. 0716
Ferrell, J.F. 0882
Findl, E. 0682
Fineberg, R.A. 1015
Finigan, A. 0785
Fitzmaurice, V.E. 0920
Flanagan, J.V. 0821
Fles, D. 0786
Flory, D.A. 0721
Fondekar, S.P. 0736
Fourie, H.O. 0936
Francis, B.H. 0986
Franklin, R. 0914
Fread, D.L. R081
Frederick, R. 0717
Fresh, K.L. 0913
Frey, M.G. 0848
Fryxell, G.A. 0839
Fukai, T. 0758
Galt, J.A. R082
Gandurina, L.V. 1079
Garrison, L.E. 1025
Garver, D.R. 0980
Gaskell, T.F. 0816
Gaskins, D.W., Jr. 0893
Gearin, L.F. 1042
Gibson, D.T. 0955
Gibson, D.T. 0956
Gill, R.J. 0683
Gillman, K. 0927
Godshall, F.A. 0917
Goetzinger, J.W. 1107
Golimbet, V.E. 0958
Golovoy, A. 1084
Goma, G. 1082
Goodman, J. 1016
Gordon, R.C. 0880
Goryachev, N.S. 1079
Gould, H.R. 0991
Graham, N.W. 1066
Grant, J.P. 1006
Green, J.M. 0693
Grew, G.W. 0698
Gronlund, W.D. 0909
Gruenfeld, M. 0717
Gruger, E.H., Jr. 0864
Guard, H.E. 0990
Gudasheva, V.M. 1079
Gudasheva, V.M. 1085
Gusev, M.V. 0957
Gustin, P. 0959
Habenicht, C.H. 0832
Hagiwara, K. 0719
Haley, W. 1011
Haley, W. 1012
Hall, C.A.S. 1018
Hampton, M.A. 1025
Hardigree, A.A. 0715
Hart, S. 0687
Harte, J. 0928
Heffernan, P.H. 1013
Heinz, G.H. 0882
Hellmann, H. 0718
Hendricks, A. 0840
Henning, F. 0787
Henry, V.D. 0908
Hershman, M.J. 1019
Hershner, C.H. 0849
Hertz, H.S. 0711
Hertz, H.S. 0742
Heygue, G. 1076
Hieftje, G.M. R072
Higashi, K. 0719
Hilpert, L.R. 0742
Hirsch, N.D. 0990
Hobbie, J.E. 0852

Hodgins, H.O. 0864
Hodgson, T.J. 0687
Hoffman, E.J. 0967
Holliday, G.H. 0804
Holmes, W.N. 0850
Homma, M. 0788
Honda, K. 0788
Hornig, A.W. 0750
Horowitz, A. 0851
Hovis, W.A. R070
Howard, R.V. 0911
Huang, W. 0723
Hunter, F.D. 0821
Hunter, J.V. 0971
Hustvedt, K.C. 1086
Hutchinson, T. 0925
Hutzinger, O. 0929
Ide, J.C. 1044
Igarashi, C. 0719
Imao, M. 1087
Inhaber, H. 0684
Irwin, W.A. 1108
Isaacson, A.D. 0822
Ivey, J.M. 0996
IMCO 1051
Jackson, B. 1020
Jacobs, W.E. 0789
Jassby, A. 0928
Jeltes, R. 0720
Jenkins, R.G. 0908
Jenkins, T. 0879
Jenkins, T. 0994
Jenkins, T.F. 0930
Johnson, L.A. 0930
Jones, C.T. 0790
Jones, M.R. 0831
Jordan, M.J. 0852
Julian, Y. 0756
JBF Scientific Corp 0968
Karinen, J.F. 0877
Karkalik, E.J. 0817
Kawashima, J. 1100
Kawauchi, A. 1100
Keane, J. R085
Kehoe, L. 0931
Keliher, T.E. 0683
Kelly, W. 1069
Kenfield, J. 1114
Kester, D.R. R080
King, K.A. 0889
Kinney, R.A. 1030
Kirchoff, W.H. 0685
Klarenberg, A. 1054
Klein, J.P. 1080
Klose, P. 1016
Knecht, R. 0893
Knoll, J.S. R070
Koeman, J.H. 0686
Komers, R. 0730
Koons, C.B. 0721
Koons, C.B. 0991
Koons, C.B. 0992
Koons, C.B. 1029
Korn, S. 0853
Korn, S. 0854
Korn, S. 0877
Koronelli, T.V. 0957
Koronelli, T.V. 0958
Korte, F. 0855
Kuehnhold, W.W. 0856
Kuhn, P.M. R071
Laevastu, T. 0981
Lanfear, K.J. 0982
Laseter, J.L. 0723
Laska, R. 1014
Lee, E. 0687
Lee, R.F. 0857
Lee, R.F. 0858
Lee, W.Y. 0846
Lee, W.Y. 0859
Lehman, H.K. 0996
Lempe, A. 0681
Levy, E.M. 0688
Levy, E.M. 0751
Lewis, J.R. 0860
Lewis, R.R. 0932
Lewis, R.S. 1088
LePetite, J. 0964
Lin, J.D. 0983
Lindorff, D.E. 1073
Linkins, A.E. 0837
Linkins, A.E. 0861
Linkins, A.E. 0867
Linkins, A.E. 0959
Lipeles, M. 1067
Lipsky, S. 0722
Lock, J. 0791
Lokabharathi, P.A. 0961
Longabucco, P. 0939
Lukasheva, T.A. 0884
Lukmanov, Yu.Kh. 0769
Lyzenga, D.R. 0703
Maciejowska, M. 0960
Mackay, D. 0943
Mackay, D. 0984
MacKay, D. 0970
MacKenzie, M.J. 0971
Maddox, K. 1113
Makepeace, M. 0933
Malins, D.C. 0863
Malins, D.C. 0864
Martin, S. 0779
Mattes, L. 0689
Mattson, J.S. 0724
Maxwell, J.R. 0705
Maxwell, J.R. 0746
May, W.E. 0711
May, W.E. 0742
Mazza, M. 0716
McAuliffe, C.D. 0792
McAuliffe, C.D. 1029
McCain, B.B. 0909
McCracken, W. 0794
McCracken, W.E. 0793
McCullough, D.R. R083
McFadden, T.T. 0930
McFall, J.A. 0723
McGill, W.B. 0969
McKendrick, J.D. 0795
McKendrick, J.D. 0895
McLaughlin, D.B. 0937
McMahon, R.S. 0988
McManus, R.J. 1068
McMurray, W. 0722
McRoy, C.P. 0862
Mead, W. 0893
Mecklenburg, T.A. 0865
Menon, B. 0755
Mercer, J.N. 0721
Mercier, J.P. 1046
Meredith, D. 1047
Micheletti, W.C. 1058
Middleditch, B.S. 0725
Middleditch, B.S. 0726
Middleditch, B.S. 0727
Middleditch, B.S. 0728
Miller, B.S. 0913
Miller, M.C. 0866
Miller, O.K., Jr. 0867
Miller, O.K., Jr. 0934

Miller, O.K., Jr. 0935
Minarik, M. 0730
Minarik, Z. 0729
Minorsky, V.U. 1048
Missler, S. 0725
Mitchell, J.K. 0910
Mitchell, R. 0868
Mitchell, R. 0950
Mitchell, W.W. 0795
Mitchell, W.W. 0895
Mitsubishi Jukogyo KK 0757
Mittleman, J. 1101
Miyake, Y. 0873
Mochalova, O.S. 0769
Moldan, A. 0936
Moles, D.A. 0853
Moles, D.A. 0854
Moore, S.F. 0937
Morris, B.F. 0976
Mourlon, J.C. 0699
Moursy, A.S. 0731
Moursy, A.S. 0781
Moy, D.C. 0690
Mozley, S.C. 0869
Mukai, S. 0700
Mumphrey, A.J., Jr. 1021
Muramatsu, T. 0758
Murchelano, R. R076
Muruyama, I. 0803
Myasnikov, I.N. 1079
Myers, A.A. 1038
Myers, D. 1014
Myers, M.S. 0909
N Maine Reg Plan Comm 0798
Naess, A. 0985
Naess, E.D. 1049
Nagi, Y. 1100
Nair, S. 0961
Nakajima, A. 1087
Nakamura, Y. 0691
Nakano, S. 1089
National Cancer Institute 0732
National Marine Service Inc 0796
Neal, R.W. 0797
Nenna, V.D. 1101
Neville, R.A. 0701
Ng, J. 0990
Nicol, J.A.C. 0846
Noda, M. 1090
Nomura, K. 1090
Nunes, P. 0870
Nunes, P. 0871
O'Brien, J.W. 0872
O'Donnel, K. 0714
O'Neil, R.A. 0701
Offner, F.F. 1055
Ogata, M. 0873
Oglesky, J.L. 0996
Ohtsu, T. 0691
Olivieri, R. 0962
Ono, T. 1094
Oostdam, B.L. 1022
Oradovskii, S.G. 0733
Osamor, F.A. 1102
Palm, D.J. 0939
Pannell, O.R. 1059
Parker, B.C. 0911
Parker, T. 1014
Parulekar, A.H. 0887
Patni, N.J. 0682
Patrick, R. 0874
Patten, L.R. 0875
Patten, S.M., Jr. 0875
Payen, P. 0716
Penrose, W.R. 0693
Perrault, A.L. 1001
Perry, J.J. 0963
Peterson, B.J. 0852
Petroclearance Ltd 0799
Philip, R.P. 0746
Phillips, D.M. 0939
Pitt, D. 1050
Polglase, W. 1069
Potter, B.M. 0692
Pratapas, J. 1069
Pressey, R.E. 0832
Preus, P. 0759
Preus, P. 1103
Prien, C.H. 0832
Purves, W. 0755
Puyear, R.L. R074
Quaney, R.A. 1086
Quinn, J.G. R080
Quinn, J.G. 0967
Quinn, J.G. 0993
Racz, J.G. 0951
Ramos, L.S. 0908
Ran, N. 0940
Rao, T.K. 0715
Rath, R.J. 0986
Ravagnan, G. 0800
Ravagnan, G. 1104
Read, P.A. 0876
Reid, D.F. 0839
Reish, D.J. 1009
Renshaw, T. 0876
Resinex SpA 0760
Reynolds, J.W. 1107
Rice, S.D. 0853
Rice, S.D. 0854
Rice, S.D. 0865
Rice, S.D. 0877
Rich, N.H. 0683
Richardson, M.G. 0801
Robadue, D. 1026
Robertiello, A. 0962
Robom, R. R076
Roesijadi, G. 0836
Rogers, M.A. 0721
Roques, H. 1076
Rossiter, J.R. 0683
Rossum, P.V. 0734
Roubal, W.T. 0863
Roubal, W.T. 0878
Routson, R.C. 1091
Routson, R.C. 1092
Rowe, J.W. 1011
Rowe, J.W. 1012
Rozynov, B.V. 0958
Rutherford, C.L. 0735
Sackett, W.M. 0839
Sader, G. 1093
Sader, G. 1105
Sage, B. 1060
Sage, B. 1061
Sakiyama, T. 0941
Sandness, G.A. 0702
Sarabun, C.C. 0972
Sass, J. 0708
Satake, T. 1109
Sateva, M. 0786
Schauer, M. 1011
Schauer, M. 1012
Schomaker, K. 0737
Schultz, D.M. 0993
Schwartz, S.H. 0794
Schwarz, F.P. 0740
Science Applications, Inc 0942
Scott, B.F. 0943
Sebba, F. R085

Sen Gupta, R. 0736
Sentsova, O.X. 0957
Sexstone, A. 0851
Sexstone, A. 0879
Sexstone, A. 0994
Shaler, A.J. R085
Sharp, J.M. 1009
Shaw, D.G. 0912
Shell International Res 0802
Sherlev, P. 1110
Sherman, J.S. 1058
Shiono, S. 0803
Shore, R. 1023
Short, J.W. 0988
Sibert, J.L. 1115
Simenstad, C.A. 0913
Siniff, D.B. 1024
Slack, J.R. 0982
Sleeter, T. 0752
Smith, A. 1099
Smith, D.D. 0804
Smith, R.A. 0982
Soldatova, I.N. 0884
Southgate, T. 1038
Southworth, G.R. 0973
Sparrow, E.B. 0880
Sprague, J.B. 0881
Stadler, D. 0737
Stansell, J. 1062
Steinfort, S.N. 0913
Stoeva, S. 0957
Stollman, J. R077
Stranahan, S.I. 0886
Strandell, P.A. R084
Stroud, F.B. 1099
Suda, T. 1095
Suda, T. 1096
Sugimoto, A. 0691
Sumino, K. 0738
Susuki, H. 1094
Szaro, R.C. 0842
Szaro, R.C. 0882
Tackett, K.M. 0748
Tagatz, M.E. 0996
Tagatz, M.E. 0997
Tagger, S. 0964
Takahashi, H. 0758
Takahashi, T. 1100
Takeshita, H. 0805
Tamazaki, S. 0805
Tanaka, S. 1095
Tanaka, S. 1096
Tapley, L. 0833
Teal, J.M. 0924
Teleki, P.G. 1025
Terrell, C. 0898
Thijsse, T.H. 0720
Thomas, H.E. 0914
Thomas, L.C. 0863
Thomson, V. 0701
Tingle, A. 0987
Tippie, V. 1026
Tobia, M. 0997
Topgi, R.S. 0736
Tosteson, T.R. 0883
Traxler, R.W. 0965
Tribellini, A. 1082
Tripp, B.W. 0891
Tsikhon-Lukanina, E.A. 0884
Tsukamoto, K. 1097
Tsutomu, T. 1089
Tsygankov, A.P. 0944
Uchida, S. 0805
Uebayashi, T 0803
Ueno, S. 0700
Uhler, M. 0886
Ushakova, N.A. 0958
Ustach, J.F. 0885
US Coast Guard 0753
US Congress 0823
US DOE 0915
US EPA 0945
US EPA 1116
US FEA 0899
US FEA 0900
US FEA 0901
US FEA 0902
US FEA 0903
US FEA 0904
US FEA 0905
US FEA 0906
US FEA 0907
US FEA 1083
US Govt Accounting Ofc 1017
US Govt Accounting Ofc 1072
US GAO 1005
US GAO 1043
US Maritime Admin 1045
US NOAA 0938
US Office of Tech Staff 0916
Valencia, M.J. 1027
Van Esch, G.J. 0834
Van Lelyveld, L.H. 0929
Vanloocke, R. 0966
Varanasi, U. 0886
Velebir, K. 1110
Verlencar, X.N. 0887
Verlinde, A.M. 0966
Verstraete, W. 0966
Vestal, J.R. 0949
Vreden, N. 0689
Waggott, A. 0999
Walker, D.A. 0888
Walker, J.D. 0952
Wallace, R.R. 0838
Wallenberg, B. 0946
Walton, D.G. 0693
Ward, C.H. 1009
Ward, R.S. 0806
Warner, I.M. 0739
Wasik, S. 0740
Watanabe, K. 1098
Way, S.J. 0988
Webber, P.J. 0888
Weber, D. 0864
Weeden, S.L. 1028
Weiss, F.T. 1029
Wellings, S.R. 0909
Welsh, L.W., Jr. 0979
Welsh, M.F. 0846
Wennergren, G. 0741
Westfield, J.D. 1113
Westlake, D.W.S. 0953
Wezernak, C.T. 0703
Wheatland, A.B. 0999
Wheeler, R.B. 0992
Whipple, W. 0874
Whisman, M.L. 1107
White, C.T. 0892
White, D.H. 0889
White, J. 0704
Whitehurst, C.A. 1030
Widden, P. 0925
Wilcock, D. 1113
Wildung, R.E. 1092
Wilkerson, R.T. 1099
Wilks, A. 0984
Williams, G.N. 0980
Williams, J. 0947
Williams, R.G. 0917

Williams, S.L.	0862
Wise, S.A.	0711
Wise, S.A.	0742
Woodruff, D.L.	0836
World Meteorological Org	0974
Yamaguchi, M.	1094
Yamamoto, W.	1094
Young, J.A.	0715
Zapisek, W.F.	0707
Zenno, A.	0803
Zinn, J.	0918
Zinn, L.L.	0743
Zitko, V.	0744
Zoeteman, B.J.C.	0929
Zsolnay, A.	R073
Zsolnay, A.	0890
Zsolnay, A.	0975
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602,214	C-0769

APPENDIX A
Periodicals Reviewed

Abstracts on Health Effects of Environmental Pollutants
Alternatives: Perspectives on Society and Environment
Ambio
American Fisheries Society Transactions
Analytical Chemistry
Applied Ecology Abstracts
Applied Energy
Applied Microbiology
Applied Science & Technology Index
Aquatic Sciences & Fisheries Abstracts
Audubon
Australian Science Index
Berichte der Deutschen Wissenschaftlichen Komission fuer Meeresforschung
Bibliography and Index of Geology
Biological Abstracts
Bioresearch Index
Bioscience
British Birds
British Library. Lending Division. Index of Conference Proceedings Received
Bulletin of Environmental Contamination and Toxicology
Bulletin of Marine Science
Catalyst for Environmental Quality
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Engineering Progress
Chemical Week
Chemistry in Canada
Chemosphere
Coastal Engineering
Coastal Zone Management Journal
Conservation News
Current Contents: Life Sciences
Current Contents: Physical and Chemical Sciences
Deep-Sea Research/Oceanographic Bibliography
Ecological Abstracts
Ecological Modelling
The Ecologist
Ecology Law Quarterly
Effluent & Water Treatment Journal
Energy Information Abstracts
Energy Review
The Engineering Index Monthly
Environment

Environment Abstracts
Environment Reporter
Environmental Action
Environmental Conservation
Environmental Geology
Environmental Health and Pollution Control
Environmental Management
Environmental Periodicals Bibliography
Environmental Pollution
Environmental Research
Environmental Science & Technology
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EPA Environmental News
EPA Reports Bibliography Quarterly
ERDA Energy Research Abstracts
Estuarine and Coastal Marine Science
Fuel Abstracts and Current Titles
Geochimica et Cosmochimica Acta
Government Reports Announcements
Groundwater
Hydrocarbon Processing
India Journal of Environmental Health
Industrial Wastes Information Bulletin
INTERDOK Directory of Published Proceedings
International Aerospace Abstracts
International Journal of Ecology and Environmental Science
International Journal of Environmental Analytical Chemistry
International Journal of Environmental Studies
International Petroleum Abstracts
Iranian Journal of Science and Technology
The Journal of Applied Ecology
Journal of Canadian Petroleum Technology
Journal of Chromatography
Journal of Environmental Science and Health, Part A
Journal of Environmental Sciences
Journal of the Institute of Water Pollution Control
Journal of Petroleum Technology
Journal of the Fisheries Research Board of Canada
Journal of Toxicology and Environmental Health
Limnology and Oceanography
Marine Biological Association of the United Kingdom, Journal
Marine Biology
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Marine Geology
Marine Geotechnology
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Marine Pollution Bulletin
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Marine Science Contents Tables
Marine Technology
Marine Technology Society, Journal
Maritime Research Information Service Abstracts
Microbial Ecology
National Fisherman
National Research Council, News Report

National Wildlife
Nature
New Technical Books
Nippon Susan Gakkai Shi. Bulletin of the Japanese Society of Scientific Fisheries
Northwest and Alaska Fisheries Center Monthly Reports
Ocean Engineering
Ocean Industry
Ocean Management
Oceanic Abstracts
Oceanographic Abstracts and Bibliography
Oceanus
Offshore
Oil and Gas Journal
Oil Spill Intelligence Report
Outdoor California
Pacific Oil World
Petroleum Abstracts
Petroleum Engineer International
Petroleum Today
Pollution Abstracts
Pollution Engineering
Proceedings in Print
Progress in Water Technology
Rapports et Proces Verbaux
Resources
Resource Recovery and Conservation
Royal Society of London, Proceedings, Series B, Biological Sciences
Science
The Sciences
Science News
Science of the Total Environment
Scientific and Technical Aerospace Reports
Scientific Meetings
Sea Frontiers
Sea Secrets
Sea Technology
Selected Water Resources Abstracts
Shore and Beach
Spill Technology Newsletter
Summaries of Foreign Government Environmental Reports
Tanker Advisory Center Newsletter
Technical Book Review Index
Technology Review
Toxicity Bibliography
UDS Water Quality Control Digest
Underwater Information Bulletin
Underwater Naturalist
Waste Materials Biodegradation Research Titles
Water, Air and Soil Pollution
Water & Pollution Control
Water & Wastes Engineering
Water Pollution Control Federation, Journal
Water Research
Western Fisheries

APPENDIX B
OIL POLLUTION ABSTRACTS--AVAILABILITY LISTING

OPA -current title: OIL POLLUTION ABSTRACTS
OPR -former title: OIL POLLUTION REPORTS
OSOPR-former title: OIL SPILL AND OIL POLLUTION REPORTS

TITLE	REPORT PERIOD	EPA ACCESSION NUMBER	NTIS ORDER NUMBER	PRICE	PAGES
OSOPR	Jul 74-Oct 74	EPA 670/2-75-003	PB 240-719	$ 9.25	206
OSOPR	Nov 74-Feb 75	EPA 670/2-75-044	PB 242-542	10.75	261
OSOPR	Feb 75-Apr 75	EPA 670/2-75-059	PB 243-724	9.50	235
OSOPR	May 75-Jul 75	EPA 600/2-76-129	PB 258-852	12.00	315
OSOPR	Aug 75-Oct 75	EPA 600/2-76-113	PB 258-745	11.75	299
OSOPR	Nov 75-Jan 76	EPA 600/2-76-185	PB 257-886	12.50	353
OSOPR	Feb 76-Apr 76	EPA 600/2-76-215	PB 259-932	11.75	308
OSOPR	May 76-Jul 76	EPA 600/2-76-266	PB 264-870	12.50	345
OSOPR	Aug 76-Oct 76	EPA 600/2-77-037	PB 267-266	11.75	307
OSOPR	Nov 76-Jan 77	EPA 600/2-77-075	PB 268-248	11.75	294
OSOPR	Feb 77-Apr 77	EPA 600/2-77-111	PB 272-689	12.50	326
OSOPR	May 77-Jul 77	EPA 600/2-77-243	PB 276-691	13.00	375
OSOPR	Aug 77-Oct 77	EPA 600/2-78-005	PB 281-114	11.00	280
OSOPR	Vol. 5, No. 1 Nov 77-Jan 78	EPA 600/2-78-071	PB 281-671	9.25	190
OPR	Vol. 5, No. 2 Feb 78-May 78	EPA 600/7-78-160	PB 287-071	10.75	242
OPR	Vol. 5, No. 3 Jun 78-Sep 78	EPA 600/7-78-218	PB 290-227	11.75	294
OPR	Vol. 5, No. 4 Oct 78-Dec 78	EPA 600/7-79-040	PB 293-315	9.25	189
OPA	Vol. 6, No. 1 Jan 79-Mar 79	(Submitted 4/79)	PB ___-___	___.___	___
OPA	Vol. 6, No. 2 Apr 79-Jun 79	(Submitted 7/79)	PB ___-___	___.___	___
OPA	Vol. 6, No. 3 Jul 79-Sep 79	(Submitted 10/79)	PB ___-___	___.___	___

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